

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

UNIFIED PATENTS, LLC,
Petitioner,

v.

INVINCIBLE IP LLC,
Patent Owner.

IPR2022-00122
Patent 9,678,774 B2

Before LYNNE E. PETTIGREW, BARBARA A. PARVIS, and
CHRISTOPHER L. OGDEN, *Administrative Patent Judges*.

PARVIS, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Unified Patents, LLC (“Petitioner”) filed a Petition (Paper 1 (“Pet.”)) requesting an *inter partes* review of claims 1, 3–11, and 14–18 (“challenged claims”) of U.S. Patent No. 9,678,774 B2 (Ex. 1001, “the ’774 patent”) pursuant to 35 U.S.C. §§ 311–319, along with the supporting Declaration of Jon B. Weissman, Ph.D. (Ex. 1002). Invincible IP LLC (“Patent Owner”) did not file a Preliminary Response.

We have authority to determine whether to institute review under 35 U.S.C. § 314 and 37 C.F.R. § 42.4.

Upon consideration of the contentions and the evidence of record at this juncture, we conclude Petitioner establishes a reasonable likelihood of prevailing in demonstrating the unpatentability of claims 1, 3–11, and 14–18 of the ’774 patent. Accordingly, we grant Petitioner’s request and institute an *inter partes* review of all challenged claims of the ’774 patent and with respect to all grounds set forth in the Petition.

II. BACKGROUND

A. *Real Parties-in-Interest*

Petitioner identifies itself as the real party-in-interest. Pet. 1. Patent Owner names itself as the real party-in-interest. Paper 6.

B. *Related Matters*

Each party identifies a judicial matter that would affect, or be affected by, a decision in this proceeding. In particular, Petitioner informs us that the ’774 patent has been asserted in the following district court cases: *Invincible IP LLC v. Citrix Systems, Inc.*, No. 1:21-cv-00954 (D. Del.); *Invincible IP LLC v. Nutanix, Inc.*, No. 1:21-cv-00955 (D. Del.); *Invincible IP LLC v. Alibaba Cloud US LLC*, No. 1:21-cv-00956 (D. Del.); *Invincible IP LLC v. DigitalOcean, LLC*, No. 1:21-cv-00959 (D. Del.); and *Invincible IP LLC v.*

NetApp, Inc., No. 1:21-cv-00960 (D. Del.). Pet. 1–2. Patent Owner informs us that the '774 patent is asserted in the following pending district court case: *Invincible IP LLC v. Skytap, Inc.*, No. 1:21-cv-01829 (D. Del.). Paper 6.

C. The '774 Patent

The '774 patent relates to “methods and systems for the secure live migration of virtual machines in public clouds.” Ex. 1001, 2:6–7. An exemplary system is illustrated in Figure 5, reproduced below.

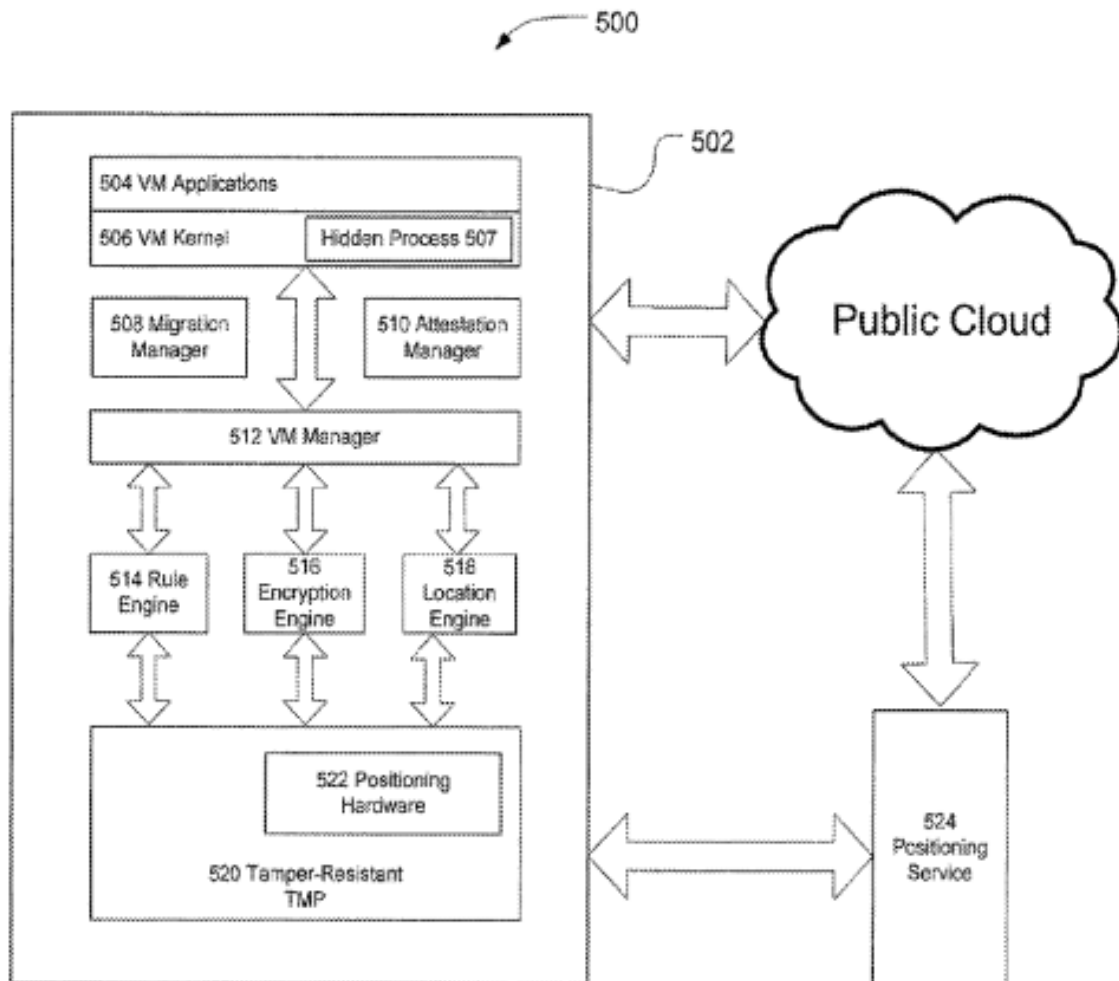


FIG. 5

Figure 5 illustrates system 500 for the secure live migration of virtual machines in public clouds. Ex. 1001, 8:2–4.

As shown above, target host platform 502 of system 500 includes Virtual Machine (VM) kernel 506 and hidden process 507, among other things. *Id.* at 8:7–12. VM kernel 506 is a core component of the VM operating system and configured to provide primary operating system functions such as resource management. *Id.* at 8:14–17. Hidden process 507 is a virtual machine kernel level process that is used to assist the target host verification process. *Id.* at 8:18–20. If a hacker manages to acquire the decryption key and attempts to execute the unauthorized virtual machine, hidden process 507 checks the hardware configuration and physical location in collaboration with positioning service 524. *Id.* at 8:26–30.

Target host platform 502 also includes positioning hardware 522 comprising a device capable of providing location estimate information. *Id.* at 9:31–32. Positioning hardware 522 allows positioning service 524 to determine the actual physical location of the target host platform 502. *Id.* at 9:34–36.

D. Illustrative Claim

Petitioner challenges claims 1, 3–11, and 14–18 of the '774 patent. Pet. 5. Claims 1, 8, and 15 are the independent claims. Claims 3–7 depend, directly or indirectly, from claim 1. Claims 9–11 and 14 depend, directly or indirectly, from claim 8. Claims 16–18 depend, directly or indirectly, from claim 15. Independent claim 1, reproduced below, is illustrative of the claimed subject matter.

1. [1 pre]¹ A method, comprising:
- [1.1] receiving, at a computing device, a request to migrate a virtual machine from a source host to a target host;
 - [1.2] determining, via a hidden process, whether a geographic location of the target host is within a particular perimeter, wherein the hidden process is executable by the virtual machine;
 - [1.3] in response to a determination that the geographic location of the target host is within the particular perimeter, allowing, via the hidden process, a migration of the virtual machine from the source host to the target host; and
 - [1.4] in response to a determination that the geographic location of the target host is outside of the particular perimeter, denying, via the hidden process, the migration of the virtual machine from the source host to the target host.

Ex. 1001, 16:54–17:3.

E. Evidence

Petitioner relies on the patent document references summarized in Table 1 below.

Name	Patent Document	Exhibit
Sharp	US 2010/0161922 A1	1007
Tracy	US 9,060,004 B1	1008
McCloy	US 2013/0007734 A1	1009
Morgan	US 8,984,104 B2	1010

F. Asserted Grounds

Petitioner asserts that the challenged claims of the '774 patent are unpatentable based on the following grounds summarized below (Pet. 5):

¹ Petitioner's designations to reference the elements of claim 1 are set forth in brackets. Pet. 18–42. Herein we refer to the elements of claim 1 using Petitioner's designations.

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1, 3–11, 14–17	103(a) ²	Sharp, Morgan, Tracy
1, 3–11, 14–18	103(a)	Sharp, Morgan, McCloy
1, 3, 8, 14, 15, 18	103(a)	McCloy, Morgan

III. ANALYSIS

A. *Legal Standards*

A patent claim is unpatentable under 35 U.S.C. § 103(a) 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 said 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 ordinary skill in the art; and (4) when in evidence, objective evidence of nonobviousness.³ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. *Level of Ordinary Skill in the Art*

Petitioner asserts that a person of ordinary skill in the art the time of the invention would have had “at least a bachelor’s degree in computer

² The Leahy-Smith America Invents Act, Pub. L. No. 112–29, 125 Stat. 284 (2011) (“AIA”), amended 35 U.S.C. §§ 102 and 103. The ’774 patent was filed April 14, 2015 and claims priority as follows: “Continuation of application No. 13/520,464 filed as application No. PCT/US2012/028333 on Mar. 8, 2012, now Pat. No. 9,054,917.” Ex. 1001, codes (22), (63). Because, based on the current record, the ’774 patent has an effective filing date before the effective date of the applicable AIA amendments, we refer to the pre-AIA version of 35 U.S.C. §§ 102 and 103.

³ Patent Owner does not present objective evidence of nonobviousness at this stage of the proceeding.

science, computer or electrical engineering, or an equivalent field, and two years of work experience in virtualization, VM migration, cloud computing, and/or distributed computer systems.” Pet. 11 (citing Ex. 1002 ¶ 28). At this stage in the proceeding, Petitioner’s proposal is unopposed.

We find that the phrase “at least” in Petitioner’s proposed definition creates a vague, open-ended upper bound for the level of ordinary skill, and we therefore do not adopt that aspect of the proposal. With that exception, considering the subject matter of the ’774 patent, the background technical field, and the asserted prior art, we otherwise agree with Petitioner’s proposed qualifications for an ordinary level of skill. Petitioner’s proposed definition is consistent with the level of skill reflected in the specification of the ’774 patent and the asserted prior art references. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

Accordingly, for purposes of this decision, and based on the current record, we adopt Petitioner’s assessment of the level of skill for one of ordinary skill in the art, except without the “at least” phrase.

C. Claim Construction

We construe the challenged claims by applying the standard used in federal courts, in other words, “the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. [§] 282(b),” which is articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b) (2020). Under this standard, the words of a claim generally are given their “ordinary and customary meaning,” which is the meaning the term would have to a person of ordinary skill at the time of the invention, in the context of the entire patent including the specification. *Phillips*, 415 F.3d at 1312–13.

Petitioner provides a proposal for only the term “hidden process” recited in each of the independent claims. Pet. 11–14. With respect to the remaining terms, Petitioner states “[t]erms not specifically construed below have their plain and ordinary meaning.” *Id.* at 11.

1. “hidden process”

Petitioner proposes that “the scope of *hidden process* encompasses ‘a process incorporated in a virtual machine’s kernel and executable by the virtual machine.’” Pet. 14 (citing Weissman ¶¶ 50–56). Petitioner asserts its proposal is based on the ’774 patent Specification. *Id.* at 12 (citing Ex. 1001, 7:56–57, 8:18–20, Fig. 5).

The ’774 patent Specification describes “by using a hidden process incorporated in a virtual machine’s kernel and a trusted wireless and/or wired positioning service, a cloud provider and/or cloud user may be alerted about possible virtual machine hijacking/theft.” Ex. 1001, 2:10–14; *see also id.* at 8:20–22 (describing that “hidden process 507 may be configured to prevent execution of a virtual machine in situations in which a hacker has obtained an unauthorized copy of a virtual machine” and is attempting to run the virtual machine). Consistent with Petitioner’s assertion, the ’774 patent Specification consistently refers to the hidden process in connection with it being a kernel-level process. *See, e.g., id.* at 8:18–20 (“Hidden process 507 may be a virtual machine kernel level process which may be used to assist the target host verification process.”), code (57) (describing “a hidden process incorporated in a virtual machine’s kernel”), 2:9–10 (describing “a hidden process incorporated in a virtual machine’s kernel”), Fig. 5 (illustrating “Hidden Process 507” within “506 VM Kernel”); 10:40–45 (describing a hidden process configured to verify a hardware configuration of a target host that may be incorporated in a kernel of the virtual machine).

Each of independent claims 1, 8, and 15 recites “wherein the hidden process is executable by the virtual machine.” The portion of Petitioner’s construction indicating that a “hidden process” is “executable by the virtual machine” appears to be redundant to that claim recitation.

At this early juncture, we preliminarily agree with Petitioner that “the scope of *hidden process* encompasses ‘a process incorporated in a virtual machine’s kernel.’” Pet. 14 (citing Weissman ¶¶ 50–56). At this juncture, we omit “and executable by the virtual machine” to avoid redundancy with the “wherein” clause reciting the same requirement.

*D. Unpatentability of Claims 1, 3–11, and 14–17 under
35 U.S.C. § 103(a) as Obvious over Sharp, Morgan, and Tracy*

Petitioner asserts that claims 1, 3–11, and 14–17 are unpatentable as obvious over Sharp, Morgan, and Tracy. Pet. 5. We begin with overviews of Sharp, Morgan, and Tracy. We then turn to Petitioner’s contentions.

1. Sharp

Sharp relates to systems and methods for migrating virtual machines. Ex. 1007 ¶ 1. Figure 2, reproduced below, depicts a system for facilitating migration of virtual machines among a plurality of physical machines. *Id.* ¶ 11.

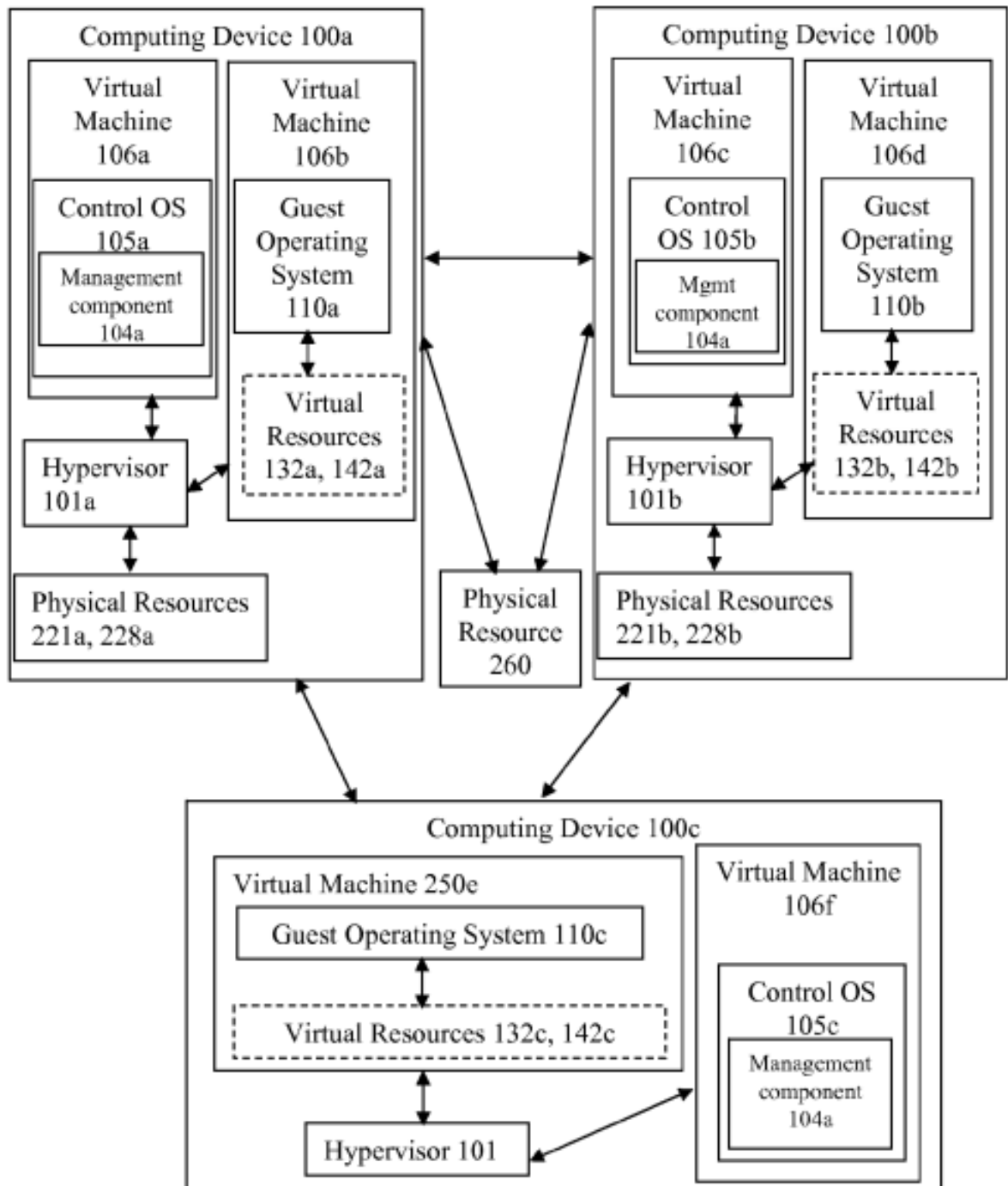


Fig. 2

Figure 2, above, is a block diagram depicting a system for facilitating migration of virtual machines among a plurality of physical machines provided as computing devices 100*a*, 100*b*, and 100*c*. *Id.* ¶¶ 48, 50.

Computing device 100*a* includes management component 104*a* and hypervisor 101*a*. *Id.* ¶ 48, Fig. 2. Computing device 100*b* includes management component 104*a* and hypervisor 101*b* and computing device 100*c* includes management component 104*a* and hypervisor 101. *Id.* Computing device 100*a* also includes a plurality of virtual machines 106*a* and 106*b*. *Id.* Computing device 100*b* includes a plurality of virtual machines 106*c* and 106*d*. *Id.* The system also includes physical resource 260. *Id.* Computing device 100*c* does not have access to physical resource 260. *Id.* ¶ 50. Computing devices 100*a* and 100*b* each have access to physical resource 260. *Id.*

Hypervisor 101*a* executes on computing device 100*a*. *Id.* ¶ 54. Hypervisor 101*a* receives, from management component 104*a*, an identification of a second computing device 100*b* and a command to migrate the virtual machine 106*b* to the identified second computing device. *Id.*

2. *Morgan*

Morgan relates to “systems and methods for a self-moving operating system installation in cloud-based network.” Ex. 1010, 1:7–9. Morgan describes “platforms and techniques in which the kernel of an operating system acting as a host operating system in a cloud-based network can be equipped or configured with a set of cloud-awareness, and/or auto-installation or auto-migration resources or capabilities.” *Id.* at 8:22–26.

Morgan, more specifically, describes the following:

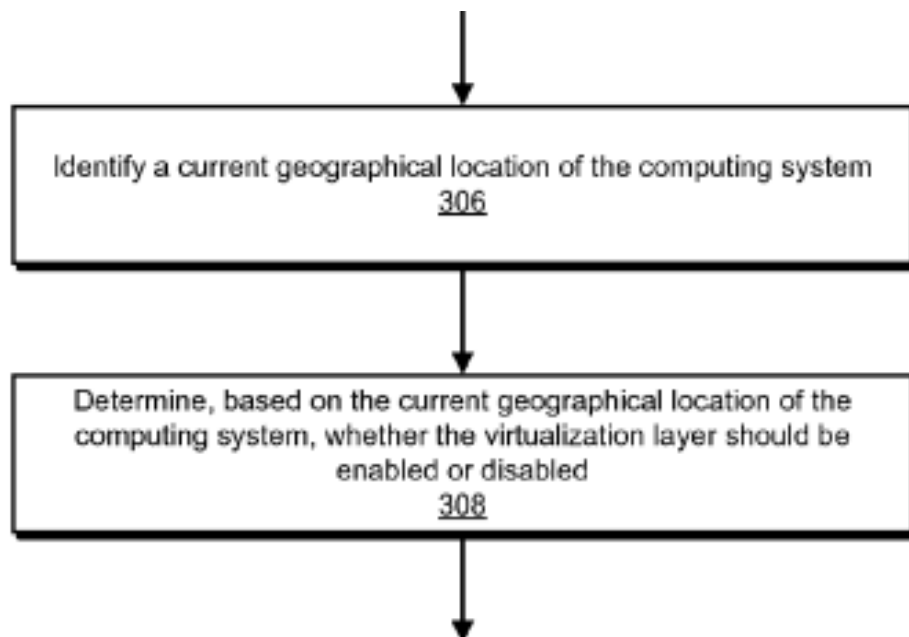
In aspects as shown, the kernel 170 can be configured or equipped with a set of services or resources including a set of

kernel services 232 to support task scheduling, file support, and other operating system services, as well as an installation tool 290 to provide control logic for the potential installation, copying, and/or migration of the guest operating system 272 on an automated basis. The installation tool 290 and/or other logic, application, platform, and/or service can be configured to perform various discovery and/or interrogation operations to determine the necessary configuration parameters and/or other resources necessary to install, move, and/or copy the guest operating system 272 to one or more target clouds 234 and/or other destinations.

Id. at 11:4–16.

3. *Tracy*

Tracy relates to systems and methods for maintaining location-aware virtualization layers. Ex. 1008, 1:37–38. Tracy describes “a computing device with virtualization layers that are enabled and/or disabled based on a geographical location of the computing device.” *Id.* at 3:66–4:2. Figure 3, reproduced below, illustrates a method for maintaining location-aware virtualization layers.



Steps 306 and 308 in Figure 3, above, are steps in a flow diagram of a computer-implemented method for maintaining location-aware virtualization layers.

Step 306 depicts identifying a current geographical location of the computing system. *Id.* at 7:55–57. A geolocation module determines a current geographical location of the computing device using, for example, a Global Positioning System (GPS) query. Step 308 depicts determining, based on the current geographical location of the computing system, whether the virtualization layer should be enabled or disabled. *Id.* at 8:10–20. A determination module determines whether to enable or disable the virtualization layer, for example, by accessing, in a database a virtualization-layer activation policy that associates a geographical location with the application and/or data in the virtualization layer. *Id.* at 8:21–26.

4. *Independent Claim 1*

a) *Element 1.pre: “[a] method, comprising”*

Petitioner asserts that Sharp discloses a “method for facilitating migration of virtual machines among a plurality of physical machines.” Pet. 18 (citing Ex. 1007 ¶¶ 55, 66, code (57), Figs. 3, 4). After consideration of the contentions and the evidence of record at this early stage, and without deciding whether the preamble is limiting, we determine that Petitioner has shown sufficiently that Sharp teaches the preamble for purposes of institution.

b) *Elements 1.1: “receiving, at a computing device, a request to migrate a virtual machine from a source host to a target host”*

Petitioner asserts that “Sharp discloses, or renders obvious, *receiving, at a computing device* (e.g., via user interface displayed on computing device 100a) *a request to migrate a virtual machine* (e.g., virtual machine

106b) *from a source host* (e.g., computing device 100a) *to a target host* (e.g., computing device 100b or 100c).” *Id.* at 18–19 (citing, e.g., Ex. 1007 ¶¶ 55, 57, Fig. 3 (step 304)). Petitioner asserts that Sharp describes a plurality of physical machines provided as computing devices 100a, 100b, 100c and management component 104a at computing device 100a, which receives a request to migrate, for example, virtual machine 106b to a second physical machine, such as computing device 100b or 100c. *Id.* at 19–21 (citing Ex. 1007 ¶¶ 48, 53, 54, 57, 59, Figs. 2, 4).

After consideration of the contentions and the evidence of record at this early stage, we determine that Petitioner has shown sufficiently that Sharp teaches element 1.1 for purposes of institution.

c) *Element 1.2: “determining, via a hidden process, whether a geographic location of the target host is within a particular perimeter, wherein the hidden process is executable by the virtual machine”*

Petitioner asserts that Sharp teaches determining whether a target host meets predetermined migration criteria. *Id.* at 23. Petitioner asserts, more specifically, that upon receiving request to migrate virtual machine 106b, management component 104 allows the request by verifying that the selected target computing device provides access to the required physical resource, or denies the request by determining that the selected target computing device does not provide access to the required physical resource. *Id.* at 23–25 (citing, e.g., Ex. 1007 ¶¶ 49, 50, 56, 59, Figs. 2, 3).

Petitioner asserts “[w]hile Sharp does not teach that its migration criteria is based on **geographic** restriction, a POSITA⁴ would have recognized that determining *whether a geographic location of the target host is within a particular perimeter* is well-known in the art, as shown, for

⁴ A POSITA is a person of ordinary skill in the art.

example, by Tracy.” *Id.* at 25. For the recitation in element 1.2 of “whether a geographic location of the target host is within a particular perimeter,” Petitioner points to Tracy’s description of “a computing device with virtualization layers that are **enabled and/or disabled based on a geographical location of the computing device.**” *Id.* at 25–26 (citing Ex. 1007, 3:66–4:2). Petitioner points to Tracy’s disclosures relating to determination module 110 determining whether to enable or disable virtualization layer 212, for example, by accessing, in database 120, a virtualization-layer activation policy that associates a geographical location with the application and/or data in the virtualization layer. *Id.* at 26–27 (citing Ex. 1007, 7:44–52, 7:55–8:50, 9:28–10:31, Figs. 3, 5).

Petitioner asserts that a person having ordinary skill in the art would have been motivated to, and found it desirable to, incorporate Tracy’s geographic location restriction to achieve the benefits disclosed by Tracy. Petitioner points to (*id.* at 31) Tracy’s disclosure in the Background section that “traditional virtualization technologies do not adequately handle security, confidentiality, and legality issues that may be associated with the use of a company’s systems and/or data.” Ex. 1008, 1:26–29.

Regarding whether a person having ordinary skill in the art would have had a reasonable expectation of success, relying on the testimony of Dr. Weissman, Petitioner argues that the proposed combination would have required “at most, minor modifications in software (e.g., in Sharp’s management component)” to implement Tracy’s geographic restriction on virtual machine migrations. Pet. 32 (citing Ex. 1002 ¶ 88). Dr. Weissman testifies a person having ordinary skill in the art “would have reasonably expected a success in including geographic location as criteria for migration.” Ex. 1002 ¶ 88. Regarding the minor modification, Dr. Weissman

testifies “[i]nstead of or in addition to checking that the target host has access to a physical resource that the virtual machine requires, the software is modified to compare the geographic location of the target host to a geographic region that the virtual machine requires or is allowed.” *Id.*

Petitioner’s contentions for the recitation of “whether a geographic location of the target host is within a particular perimeter” in element 1.2 appear to be sufficiently supported.

For “via a hidden process . . . wherein the hidden process is executable by the virtual machine” recited in element 1.2, Petitioner asserts “Morgan teaches that the kernel of a guest OS to be migrated has auto-migration (i.e., self-migration) resources or capabilities.” *Id.* at 33. Petitioner points to the following disclosure in Morgan.

[T]he **kernel of an operating system** acting as a host operating system in a cloud-based network can be equipped or configured with a set of cloud-awareness, and/or auto-installation or **auto-migration resources or capabilities**. The **cloud-aware kernel of the operating system** can be configured to contain capabilities and/or services to be able to detect and identify the identity, type, or other information of the cloud in which the operating system is installed, **directly at the kernel level and without a need to invoke third-party applications or services located outside of the kernel**. The kernel of the host operating system can likewise be **configured to contain installation tools and resources to permit the kernel to receive or access an identification of a target cloud environment to which the operating system is to be installed, copied, and/or migrated**, and automatically discover and install necessary resources to permit the seamless and/or automatic installation of the operating system to that target cloud or clouds.

Pet. 33–34 (citing Ex. 1010, 8:23–40).

Petitioner asserts that Morgan’s guest operating system 272 has self-migration capabilities. *Id.* at 34–35 (citing Ex. 1010, 8:63–67, 10:46–50,

10:60–64, 11:4–10, 13:37–14:13, Figs. 4, 7). Petitioner points to Morgan’s teachings relating to installation tool 290 that provides control logic for automated migration. *Id.* at 35–36 (citing, *e.g.*, Ex. 1010, 11:4–15).

For the reasons given with respect to claim construction (*see supra* Section III.C.1), we preliminarily determine that the scope of “hidden process” encompasses “a process incorporated in a virtual machine’s kernel.” We use that determination herein.

Regarding reasoning to combine, Petitioner asserts the following:

[A] POSITA would have applied Morgan’s self-migration technique to Sharp’s system because Morgan provided an express motivation to do so such that administrators do not “need to manually specify the APIs and/or other resources or configuration data necessary to initially install, copy, and/or move or migrate the operating system in a target host cloud.”

Id. at 37 (citing Ex. 1010, 1:66–2:5).

Petitioner also asserts that a person having ordinary skill in the art would have made the proposed combination to improve security and flexibility. *Id.* at 38. Petitioner points to conference proceedings, Hansen⁵ and Clark,⁶ as evidence that self-migration of a guest OS was well known. *Id.* at 37. Petitioner identifies disclosures in Hansen and Clark that Petitioner asserts provide further evidence that a person having ordinary skill in the art would have recognized the benefits of making the proposed combination. *Id.* at 37–38 (citing, *e.g.*, Ex. 1012, 3; Ex. 1013, 8).

⁵ Jacob Gorm Hansen and Eric Jul, *Self-migration of Operating Systems*, EW11: ACM SIGOPS European Workshop (2004) (“Hansen,” Ex. 1012).

⁶ Christopher Clark et al., *Live Migration of Virtual Machines*, NSDI ’05: 2nd Symposium on Networked Systems Design & Implementation, USENIX Assoc. (2005) (“Clark,” Ex. 1013).

Regarding whether a person having ordinary skill in the art would have had a reasonable expectation of success, relying on the testimony of Dr. Weissman, Petitioner argues the following:

[A] POSITA would have expected the combination to be readily implemented by software modification to incorporate Sharp's management component functionality in the kernel of the guest OS in the VM to be migrated since receiving a target host as a migration destination is carried out by both Morgan's guest OS and Sharp's management component.

Id. at 39–40 (Ex. 1002 ¶ 97). Regarding implementing the combination “readily,” Dr. Weissman testifies “one common operation already carried out by the guest operating system in Morgan and the management component in Sharp is to receive a target host as a migration destination.” Ex. 1002 ¶ 97.

Petitioner's contentions for the recitation “via a hidden process . . . wherein the hidden process is executable by the virtual machine” in element 1.2 appear to be sufficiently supported.

In summary, Petitioner's contentions for element 1.2 are supported sufficiently at this juncture by the cited portions of Sharp, Morgan, and Tracy. Also, we are persuaded that Petitioner has offered articulated reasoning with a rational underpinning as to why one of ordinary skill in the art would have combined the teachings of Sharp, Morgan, and Tracy in the manner recited in claim 1 sufficient for purposes of institution.

Accordingly, after consideration of the contentions and the evidence of record at this early stage, we determine that Petitioner has shown sufficiently that the combination of Sharp, Morgan, and Tracy teaches element 1.2 of claim 1 for purposes of institution.

d) Element 1.3: “in response to a determination that the geographic location of the target host is within the particular perimeter, allowing, via

the hidden process, a migration of the virtual machine from the source host to the target host; and”

Petitioner points (Pet. 40–52) to Tracy’s teaching that “determination module 110 may direct virtualization subsystem 104 to enable virtualization layer 212 if the current location of computing device 202 is within the geographical location associated with the application and/or data in the virtualization layer.” Ex. 1008, 8:41–45.

Petitioner’s contentions are supported sufficiently at this juncture by the cited portions of Tracy. After consideration of the contentions and the evidence of record at this early stage, we determine that Petitioner has shown sufficiently that the combination of Sharp, Morgan, and Tracy teaches element 1.3 of claim 1 for purposes of institution.

e) Element 1.4: “in response to a determination that the geographic location of the target host is outside of the particular perimeter, denying, via the hidden process, the migration of the virtual machine from the source host to the target host.”

Petitioner points (Pet. 42–43) to Tracy’s teaching that “determination module 110 may direct virtualization subsystem 104 to disable virtualization layer 212 if the current location of computing device 202 is not within the geographical location associated with the application and/or data in the virtualization layer.” Ex. 1008, 8:45–50.

Petitioner’s contentions are supported sufficiently at this juncture by the cited portions of Tracy. After consideration of the contentions and the evidence of record at this early stage, we determine that Petitioner has shown sufficiently that the combination of Sharp, Morgan, and Tracy teaches element 1.4 of claim 1 for purposes of institution.

f) Conclusion

After consideration of the contentions and the evidence of record at this early stage, we determine that Petitioner has shown sufficiently, for purposes of institution, that the combination of Sharp, Morgan, and Tracy teaches each recitation of claim 1. Also, at this juncture, we are persuaded that Petitioner has articulated sufficiently persuasive reasoning, based on the evidence of record, as to why one of ordinary skill in the art would have combined the teachings of Sharp, Morgan, and Tracy in the manner recited in claim 1.

Accordingly, we conclude that Petitioner has demonstrated a reasonable likelihood that it would prevail in showing that claim 1 is unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Sharp, Morgan, and Tracy.

5. Independent Claims 8 and 15

Independent claim 8 is similar to independent claim 1, except claim 8 further recites certain features relating to hardware components. For instance, claim 8 further recites “a computing device comprising one or more processing units” and “a memory communicatively coupled to the one or more processor units.” Petitioner points to Sharp’s teachings relating to computing device 100. *Id.* at 53–56 (citing, *e.g.*, Ex. 1007 ¶¶ 7, 14, 26–29, 31, 46, 54, Figs. 1A–1C, 2).

Sharp describes that “computing device 100 includes a central processing unit 121, and a main memory unit 122.” Ex. 1007 ¶ 26. Sharp also describes that “central processing unit 121 is any logic circuitry that responds to and processes instructions fetched from the main memory unit 122” and “computing device 100 may be based on any of [the processors manufactured by Intel Corporation, Motorola Corporation, Transmeta

Corporation, International Business Machines, and Advanced Micro Devices] or any other processor capable of operating as described herein.”
Id. ¶ 27.

Petitioner asserts that Sharp’s Figures 1B and 1C show “a computing device 100 including a storage device 128, a main memory unit 122, and a cache memory 140, all communicatively coupled to the central processing unit 121.” Pet. 54–55. Figure 1B is reproduced below.

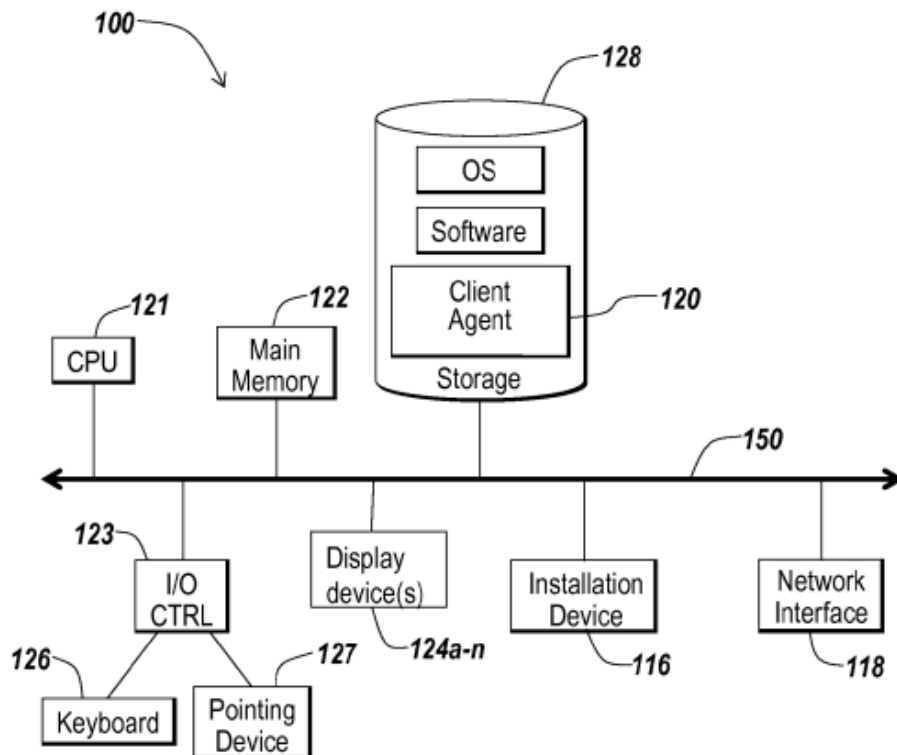


Fig. 1B

Figure 1B, above, is a block diagram of computing device 100, which as shown includes central processing unit 121, main memory unit 122, storage device 128, and system bus 150. Ex. 1007 ¶¶ 26, 28.

Independent claim 15 recites “[a] non-transitory computer-readable storage medium having stored therein processor-executable instructions” that perform steps similar to those recited in claims 1 and 8. For claim 15, Petitioner refers to its contentions for claims 1 and 8. Pet. 62–64.

After consideration of the contentions and the evidence of record at this early stage, we determine that Petitioner has shown sufficiently that the combination of Sharp, Morgan, and Tracy teaches each recitation of claims 8 and 15 for purposes of institution. Also, at this juncture, we are persuaded that Petitioner has articulated a sufficiently persuasive argument as to why one of ordinary skill in the art would have combined the teachings of Sharp, Morgan, and Tracy in the manner recited in the claims.

Accordingly, we conclude that Petitioner has demonstrated a reasonable likelihood that it would prevail in showing that claims 8 and 15 are unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Sharp, Morgan, and Tracy.

6. *Dependent Claims 3–7, 9–11, 14, 16, and 17*

We have considered Petitioner’s arguments and evidence for dependent claims 3–7, 9–11, 14, 16, and 17 and are persuaded that Petitioner has shown sufficiently that the combination of Sharp, Morgan, and Tracy teaches the further recitations in each of those dependent claims. After consideration of the contentions and the evidence of record at this juncture, we conclude that Petitioner has demonstrated a reasonable likelihood that it would prevail in showing that claims 3–7, 9–11, 14, 16, and 17 are

unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Sharp, Morgan, and Tracy.

E. Unpatentability of Claims 1, 3–11, and 14–18 under 35 U.S.C. § 103(a) as Obvious over Sharp, Morgan, and McCloy

Petitioner asserts that claims 1, 3–11, and 14–18 are unpatentable as obvious over Sharp, Morgan, and McCloy. Pet. 5. We begin with an overview of McCloy. We then turn to Petitioner’s contentions.

1. McCloy

McCloy relates to virtual machine allocation. Ex. 1009 ¶ 10. Figure 4 of McCloy illustrates a system for virtual machine allocation. *Id.* ¶ 8.

Figure

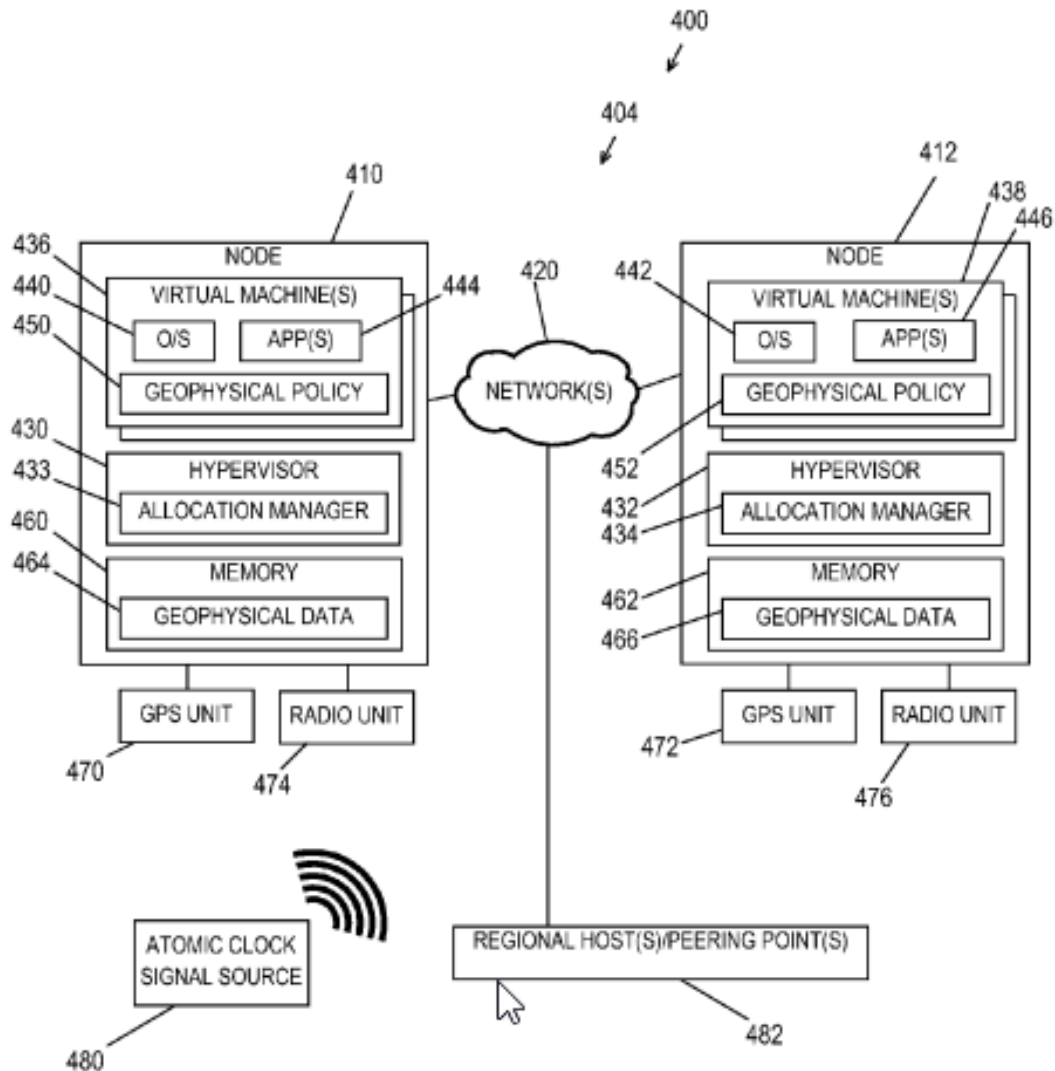


FIG. 4

4, above, illustrates system 400 for virtual machine allocation including hosts 410 and 412, among other things. *Id.* ¶ 52.

Hosts 410 and 412 represent physical computing and/or data processing platforms each respectively executing hypervisors 430 and 432 and virtual machines 436 and 438. *Id.* ¶ 53. Each virtual machine 436 and 438 may respectively support an instance of an operating system 440 and

442 and one or more applications 444 and 446 executable on the virtual processing device allocated to the respective virtual machine 436 and 438. *Id.* Each virtual machine 436 and 438 respectively includes a geophysical policy 450 and 452. *Id.* ¶ 54. Each geophysical policy 450 and 452 sets forth information indicating a geophysical location where the respective virtual machine 436 and 438 may be executed. *Id.*

2. *Independent Claim 1*

Petitioner relies on McCloy as an alternative to Tracy for teaching “whether a geographic location of the target host is within a particular perimeter” recited in element 1.2. Petitioner points to McCloy’s teaching that “[e]ach virtual machine 436 and 438 includes a geophysical policy 450 and 452, which indicates a geophysical location where the respective virtual machine 436 and 438 may be executed.” Pet. 29 (citing Ex. 1009 ¶ 54). Petitioner asserts “[i]n response to a request to migrate a VM from a source host to a target host, either the source host or the target host may clear the geophysical policy of the VM to be migrated based on the geophysical location of the target host to allow or deny the migration.” *Id.* at 30 (citing Ex. 1009 ¶¶ 60, 63).

McCloy describes the following:

[I]n some embodiments, in response to a request to migrate a virtual machine from one host (source host) to another host (target host), the target host may access the geophysical policy of the virtual machine to be migrated to verify that any geophysical policy requirements are cleared (i.e., the geophysical policy of the virtual machine to be migrated corresponds to the geophysical location of the target host) before migration of the virtual machine is allowed. Alternatively, the source host may request the geophysical location from the target host before migration to clear the geophysical policy of the virtual machine to be migrated. If the geophysical policy of the

virtual machine to be migrated does not correspond to the geophysical location of the target host, migration of the virtual machine is denied and/or aborted.

Ex. 1009 ¶ 60.

Petitioner asserts that a person having ordinary skill in the art would have been motivated to, and found it desirable to, incorporate McCloy's geographic location restriction to achieve the benefits disclosed by McCloy. Petitioner points to (Pet. 31) McCloy's disclosure of using geophysical policies 450 and/or 452 "to control where the virtual machine and workloads are running." Ex. 1009 ¶ 54.

Regarding whether a person having ordinary skill in the art would have had a reasonable expectation of success, relying on the testimony of Dr. Weissman, Petitioner argues that the proposed combination would have required "at most, minor modifications in software (e.g., in Sharp's management component)" to implement McCloy's geographic restriction on virtual machine migrations. Pet. 32 (citing Ex. 1002 ¶ 88). Dr. Weissman testifies a person having ordinary skill in the art "would have reasonably expected a success in including geographic location as criteria for migration." Ex. 1002 ¶ 88. Regarding the minor modification, Dr. Weissman testifies "[i]nstead of or in addition to checking that the target host has access to a physical resource that the virtual machine requires, the software is modified to compare the geographic location of the target host to a geographic region that the virtual machine requires or is allowed." *Id.*

In summary, Petitioner's contentions for "whether a geographic location of the target host is within a particular perimeter" recited in element 1.2 are supported sufficiently at this juncture by the cited portions of McCloy. For the reasons given above (*see supra* Section III.D.4),

Petitioner's contentions for the remaining elements are supported sufficiently at this juncture by the cited portions of Sharp and Morgan. Also, for the reasons given herein (*see supra* Sections III.D.4, III.E.2), we determine that Petitioner's showing relating to reasoning to combine is sufficient for institution.

Accordingly, we conclude that Petitioner has demonstrated a reasonable likelihood that it would prevail in showing that claim 1 is unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Sharp, Morgan, and McCloy.

3. *Independent Claims 8 and 15*

The analysis for “whether a geographic location of the target host is within a particular perimeter” recited in element 1.2 for claims 8 and 15 is the same as that for claim 1. For the reasons given for claim 1, Petitioner's contentions are supported sufficiently at this juncture. *See supra* Section III.E.2. After consideration of the contentions and the evidence of record at this juncture, we conclude that Petitioner has demonstrated a reasonable likelihood that it would prevail in showing that claims 8 and 15 are unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Sharp, Morgan, and McCloy.

4. *Dependent Claims 3–7, 9–11, 14, and 16–18*

We have considered Petitioner's arguments and evidence for dependent claims 3–7, 9–11, 14, and 16–18 and are persuaded that Petitioner has shown sufficiently that the combination of Sharp, Morgan, and McCloy teaches the further recitations in each of those dependent claims. After consideration of the contentions and the evidence of record at this juncture, we conclude that Petitioner has demonstrated a reasonable likelihood that it

would prevail in showing that claims 3–7, 9–11, 14, and 16–18 are unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Sharp, Morgan, and McCloy.

F. Unpatentability of Claims 1, 3, 8, 14, 15, and 18 under 35 U.S.C. § 103(a) over McCloy and Morgan

Petitioner asserts that claims 1, 3, 8, 14, 15, and 18 are unpatentable as obvious over the combination of McCloy and Morgan. Pet. 5.

1. Claim 1

For the preamble, i.e., “[a] method, comprising,” Petitioner points to McCloy’s disclosure of “a **method**, system and computer program product for virtual machine allocation.” Pet. 68 (citing Ex. 1009, code (57)). For element 1.1., i.e., “receiving, at a computing device, a request to migrate a virtual machine from a source host to a target host,” Petitioner asserts “McCloy teaches that hypervisor 430 **at physical computing platform 410** receives a request to execute virtual machine 436, which may be **a request to migrate a VM from source host 412 to target host 410.**” *Id.* at 68–69 (Ex. 1009 ¶¶ 53, 59, 62, Fig. 5 (Step 502)). For the remaining elements, Petitioner points to its contentions and evidence provided for obviousness over Sharp, McCloy, and Morgan. *Id.* at 69–74.

Regarding reasoning to combine, Petitioner asserts the following:

[A] POSITA would have applied Morgan’s self-migration technique to McCloy’s system because Morgan provided an express motivation to do so such that administrators do not “need to manually specify the APIs and/or other resources or configuration data necessary to . . . migrate the operating system in a target host cloud.”

Id. at 69–70 (citing Ex. 1010, 1:66–2:5).

Petitioner also asserts that a person having ordinary skill in the art would have made the proposed combination to improve security and flexibility. *Id.* at 70. Petitioner identifies disclosures in Hansen and Clark that Petitioner asserts provide further evidence that a person having ordinary skill in the art would have recognized the benefits of making the proposed combination. *Id.* at 70 (citing, *e.g.*, Ex. 1012, 3; Ex. 1013, 8).

Regarding whether a person having ordinary skill in the art would have had a reasonable expectation of success, relying on the testimony of Dr. Weissman, Petitioner argues the following:

[A] POSITA would have expected the combination to be readily implemented by software modification to incorporate McCloy's hypervisor functionality in the kernel of the OS in the VM to be migrated since receiving a target host as a migration destination is carried out by both Morgan's guest OS and McCloy's hypervisor.

Id. at 71 (Ex. 1002 ¶ 115). Regarding implementing the combination "readily," Dr. Weissman testifies "one common operation already carried out by the guest operating system in Morgan and the hypervisor in McCloy is to receive a target host as a migration destination." Ex. 1002 ¶ 115.

After consideration of the contentions and the evidence of record at this early stage, we determine that Petitioner has shown sufficiently, for purposes of institution, that the combination of McCloy and Morgan teaches each recitation of claim 1. Also, at this juncture, we are persuaded that Petitioner has articulated a sufficiently persuasive rationale as to why one of ordinary skill in the art would have combined the teachings of McCloy and Morgan in the manner recited in claim 1.

Accordingly, we conclude that Petitioner has demonstrated a reasonable likelihood that it would prevail in showing that claim 1 is

unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of McCloy and Morgan.

2. *Independent Claims 8 and 15*

Independent claim 8 is similar to independent claim 1, except claim 8 further recites certain features relating to hardware components. For instance, claim 8 further recites “a computing device comprising one or more processor units” and “a memory communicatively coupled to the one or more processor units.” Petitioner points to McCloy’s disclosure relating to computer system/server 12. Pet. 74–76 (citing Ex. 1009 ¶¶ 16, 38, 40, 41, 43, 44, 59, 60, Figs. 1, 4, code (57)). For instance, Petitioner points (*id.*) to McCloy’s disclosure that “[t]he components of computer system/server 12 may include, but are not limited to, one or more processors or processing units 16, a system memory 28, and a bus 18 that couples various system components including system memory 28 to processor 16. Ex. 1009 ¶ 40.

Independent claim 15 recites “[a] non-transitory computer-readable storage medium having stored therein processor-executable instructions” that performs steps similar to those recited in claims 1 and 8. For claim 15, Petitioner refers to its contentions for claims 1 and 8. Pet. 78–79.

After consideration of the contentions and the evidence of record at this early stage, we determine that Petitioner has shown sufficiently that the combination of McCloy and Morgan teaches each recitation of claims 8 and 15 for purposes of institution. Also, at this juncture, we are persuaded that Petitioner has articulated sufficiently persuasive reasoning as to why one of ordinary skill in the art would have combined the teachings of McCloy and Morgan in the manner recited in the claims.

Accordingly, we conclude that Petitioner has demonstrated a reasonable likelihood that it would prevail in showing that claims 8 and 15

are unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of McCloy and Morgan.

3. *Dependent Claims 3, 14, and 18*

We have considered Petitioner's arguments and evidence for dependent claims 3, 14, and 18 and are persuaded that Petitioner has shown sufficiently that the combination of McCloy and Morgan teaches the further recitations in each of those dependent claims. Also, at this juncture, we are persuaded that Petitioner has articulated sufficiently persuasive reasoning as to why one of ordinary skill in the art would have combined the teachings of McCloy and Morgan in the manner recited in claims 3, 14, and 18.

After consideration of the contentions and the evidence of record at this juncture, we conclude that Petitioner has demonstrated a reasonable likelihood that it would prevail in showing that claims 3, 14, and 18 are unpatentable under 35 U.S.C. § 103(a) over the combination of McCloy and Morgan.

IV. CONCLUSION

For the foregoing reasons, we conclude that the information presented in the Petition establishes a reasonable likelihood that Petitioner would prevail in showing that claims 1, 3–11, and 14–18 of the '774 patent are unpatentable.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that *inter partes* review of claims 1, 3–11, and 14–18 of the '774 patent is hereby instituted on all grounds stated in the Petition; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial; the trial will commence on the entry date of this decision.

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Patent 9,678,774 B2

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