

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

UNIFIED PATENTS, LLC,
Petitioner,

v.

INVINCIBLE IP LLC,
Patent Owner.

IPR2022-01168
Patent 9,635,134 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 1–18 (“challenged claims”) of U.S. Patent No. 9,635,134 B2 (Ex. 1001, “the ’134 patent”) pursuant to 35 U.S.C. §§ 311–319, along with the supporting Declaration of Dr. Erez Zadok (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 1–18 of the ’134 patent. Accordingly, we grant Petitioner’s request and institute an *inter partes* review of all challenged claims of the ’134 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 5.

B. *Related Matters*

The parties inform us that the ’134 patent is asserted in the following pending district court case: *Invincible IP, LLC v. McAfee, LLC*, No. 4-22-cv-00458 (E.D. Tex.). Paper 5, 1; Pet. 2. Also, Petitioner informs us that the ’134 patent has been asserted in the following dismissed 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.); *Invincible IP LLC v. NetApp, Inc.*, No. 1:21-cv-00960 (D. Del.); *Invincible IP, LLC v. LifeRay Cloud, Inc.*, No. 1-21-cv-01226 (D. Del.); *Invincible IP, LLC v. HashiCorp, Inc.*, No. 1-21-cv-01227 (D. Del.); *Invincible IP, LLC v. Kemp Technologies Inc.*, No. 1-21-cv-01835 (D. Del.); *Invincible IP, LLC v. OVH US LLC*, No. 1-21-cv-00262 (D. Del.); *Invincible IP, LLC v. Rackspace Technology, Inc.*, No. 1-21-cv-00274 (D. Del.). Pet. 1–2.

C. The '134 Patent

The '134 patent is titled “Resource Management in a Cloud Computing Environment.” Ex. 1001, code (54). The '134 patent relates to methods and systems for managing resources in a cloud computing environment. *Id.* at 1:31–33, 1:62–63. An exemplary system is illustrated in Figure 1, reproduced below.

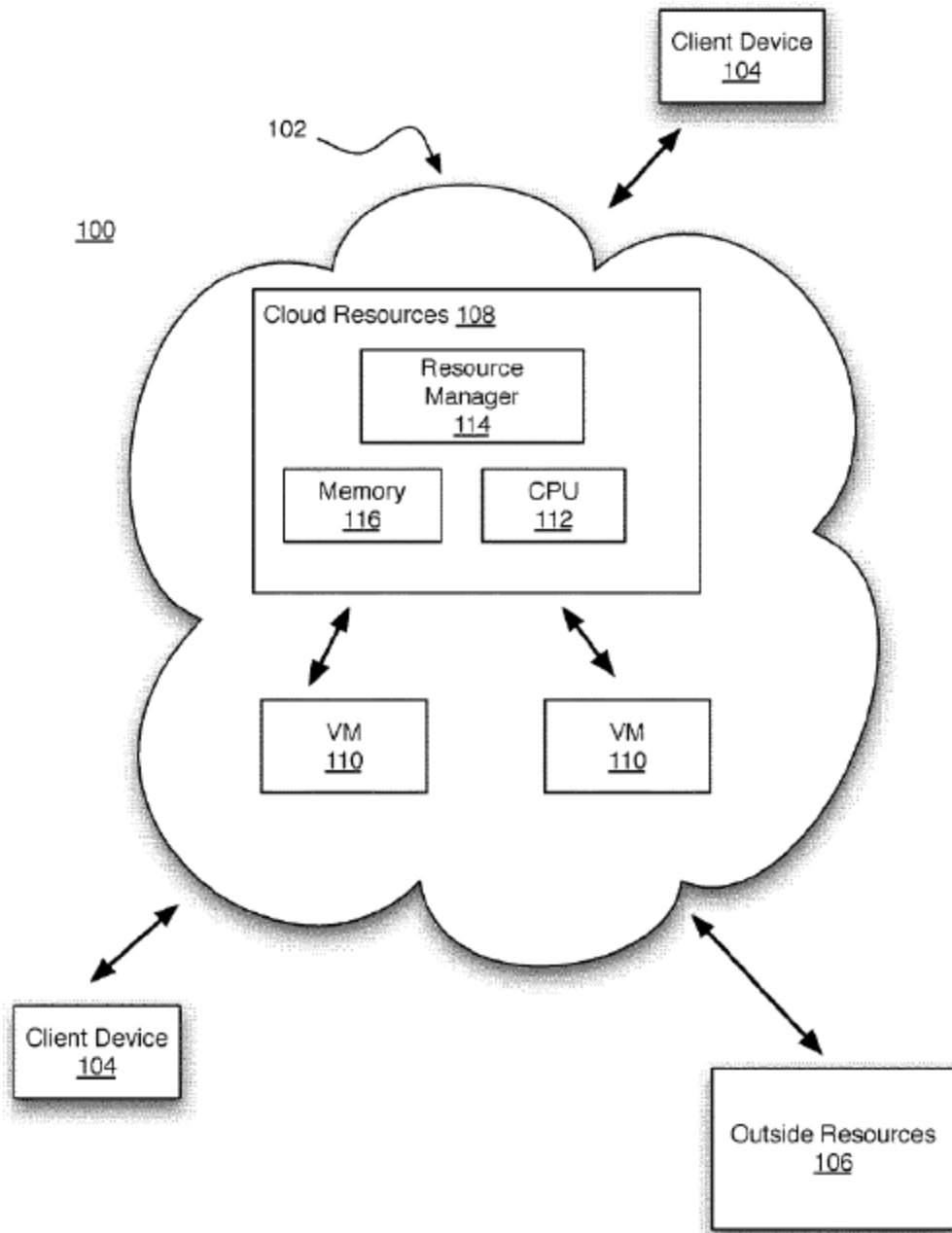


Fig. 1

Figure 1 illustrates a block diagram of system 100 for managing resources in cloud 102. *Id.* at 4:28–31.

As shown in Figure 1, cloud 102 is coupled to client devices 104 and outside resources 106. *Id.* at 4:36–40. Cloud 102 includes cloud resources 108 and virtual machines (VMs) 110. *Id.* at 4:32–34. Cloud resources 108 may include memory 116, processor 112, and resource manager 114. *Id.* at 4:34–36.

The '134 patent describes that resource manager 114 facilitates resource management for cloud 102 including migration of VMs 110. *Id.* at 5:37–40. Resource manager 114 determines a consumption rate of cloud resources 108 by VMs 110. *Id.* at 5:41–43. Based on the determined consumption rate, resource manager 114 prioritizes VMs 110 for consumption of cloud resources 108 using a first resource management scheme. *Id.* at 5:43–46. When a change in consumption rate is detected, based in part on the detected change, resource manager may prioritize one or more VMs 110 for consumption of cloud resources 108 using a second resource management scheme. *Id.* at 5:46–50. Resource manager 114 may determine a consumption rate by monitoring at least one of CPU 112 usage, memory 116 usage, or input/output access rates. *Id.* at 5:51–53.

D. Illustrative Claim

Petitioner challenges claims 1–18 of the '134 patent. Pet. 1, 3. Claims 1, 7, and 13 are the independent claims. Claims 2–6 depend, directly or indirectly, from claim 1. Claims 8–12 depend, directly or indirectly, from claim 7. Claims 14–18 depend, directly or indirectly, from claim 13. Independent claim 1, reproduced below, is illustrative of the claimed subject matter.

1. [1.Preamble]¹ A method to manage resources in a cloud computing environment, comprising:

- [1.1] determining a consumption rate of cloud resources by one or more virtual machines (VMs), the determining based on monitoring at least one of processor usage, memory usage, or input/output (I/O) access rates for the one or more virtual machines in the cloud computing environment;
- [1.2] prioritizing the one or more VMs for consumption of the cloud resources using a first resource management scheme based, at least in part, on the determined consumption rate;
- [1.3] determining whether a change in the consumption rate of the cloud resources exceeds a predetermined threshold, the change in the consumption rate including a change in the at least one of processor usage, memory usage, I/O access rates, or a change region size based on changed regions of a graphical display generated by the one or more VMs;
- [1.4] prioritizing the one or more VMs for consumption of the cloud resources using a second resource management scheme based, at least in part, on a maximum capacity for utilization of allowed cloud resources for the cloud computing environment and whether the determined change in the consumption rate of the cloud resources exceeds the predetermined threshold; and
- [1.5] migrating the consumption of the cloud resources to alternate cloud resources located outside of the cloud computing environment for at least one of the one or more VMs based, at least in part, on the one or more VMs prioritized for consumption of the cloud resources using the second resource management scheme.

Ex. 1001, 14:52–15:16.

¹ Petitioner's designations to reference the elements of claim 1 are set forth in brackets. Pet. 20–35. Herein we refer to the elements of claim 1 using Petitioner's designations.

E. Evidence

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

Name	Patent Document	Exhibit
Ferris	US 2009/0300635 A1, published Dec. 3, 2009	1006
van Riel	US 2009/0182950 A1, published July 16, 2009	1007

Petitioner relies on the non-patent literature reference summarized below.

Name	Non-Patent Literature Title	Author(s)	Exhibit
Xu	<i>A Multi-objective Approach to Virtual Machine Management in Datacenters</i> , ICAC'11: Proceedings of the 8th ACM International Conference on Autonomic Computing (2011)	Jing Xu, José A. B. Fortes	1005

F. Asserted Grounds

Petitioner asserts that the challenged claims of the '134 patent are unpatentable based on the following grounds summarized below (Pet. 3):

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1, 5, 7, 11, 13, 17	103(a) ²	Xu, Ferris
2–4, 6, 8–10, 12, 14–16, 18	103(a)	Xu, Ferris, van Riel

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 '134 patent was filed as a national-stage application on Aug. 19, 2013, and claims priority to a PCT application filed July 3, 2012. Ex. 1001, codes (22), (86). Because, based on the current record, the '134 patent has an effective filing date

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 science, computer engineering, electrical engineering, or a related degree; and 2-3 years of experience with distributed computing environments.” Pet. 7 (citing Ex. 1002 ¶ 39–40). 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

before the effective date of the applicable AIA amendments, we refer to the pre-AIA versions of 35 U.S.C. §§ 102 and 103. Our analysis would not change under the AIA versions of §§ 102, 103.

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

we therefore do not adopt that aspect of the proposal. With that exception, considering the subject matter of the '134 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 '134 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 contends that, as to the phrase "determining a consumption rate of cloud resources by one or more virtual machines (VMs)," recited in claim 1 and "analogous limitations" in claims 7 and 13, a person of ordinary skill in the art "reading the claims in light of the specification would have understood that the claims' use of 'by one or more [VMs]' refers to consumption rates of cloud resources by the VMs (i.e., the rate at which the VMs are consuming the cloud resources), not determination performed by

the VMs.” Pet. 8 (citing Ex. 1002 ¶¶ 111–113). Petitioner argues that its proposal is consistent with the ’134 patent Specification. *Id.* (citing, e.g., Ex. 1001, 4:62–66, 5:15–17, 5:37–43, 5:51–53, Fig. 1). We preliminarily find Petitioner’s unopposed proposal consistent with the intrinsic record based on the record before us at this early juncture.

*D. Unpatentability of Claims 1, 5, 7, 11, 13, and 17 under
35 U.S.C. § 103(a) as Obvious over Xu and Ferris*

Petitioner asserts that claims 1, 5, 7, 11, 13, and 17 are unpatentable as obvious over Xu and Ferris. Pet. 3. We begin with overviews of Xu and Ferris. We then turn to Petitioner’s contentions.

1. Xu

Xu is titled “A Multi-objective Approach to Virtual Machine Management in Datacenters.” Ex. 1005, 1.⁴ Xu relates to sharing of server resources by “multiple isolated execution environments deployed on virtual machines (VMs).” *Id.* Xu “proposes an automated VM management framework through a cross-layer control approach. The information from both the platform layer and the virtualization layer is conveyed to a global controller for determining the control actions across the layers.” *Id.*

Xu uses multiple sensors, to monitor resource usage, power consumption and temperature of server nodes, as well as resource utilization of individual VMs hosted on those nodes. *Id.* 2. Xu has a centralized profiling repository, where “profiling and modeling components utilize the monitoring data to create models of power and temperature, which are later used by the controller to optimize its decisions.” *Id.*

⁴ We use the pages numbers of the exhibit inserted by Petitioner to reference the pages of Xu as the original page numbers are missing from certain pages.

Xu describes functions of the controller are condition detection, VM selection, and host selection. *Id.* 2–3. According to Xu, dynamic VM placement is necessary in three conditions: thermal emergency, resource contention, and low energy efficiency. *Id.* 2. The controller periodically checks these conditions to determine when an action needs to be performed. *Id.* at 2. The VM selection function performed by the controller determines which VMs should be moved considering the benefits and costs of the migrations. *Id.* at 3. Xu’s controller then performs the host selection function to determine a destination host for the selected VM. *Id.*

2. *Ferris*

Ferris is titled “Methods and Systems for Providing a Marketplace for Cloud-based Networks.” Ex. 1006, code (54). *Ferris* relates to “systems and methods for cloud computing related services and products.” *Id.* ¶ 1.

Ferris describes retrieving, from cloud computing environments, resource and service data which describes the capabilities, services, status, and cost of the cloud computing environment. *Id.* ¶ 12. *Ferris* describes that its cloud marketplace system is configured to use the resource and service data to provide migration for virtual machines initiated in the cloud computing environments. *Id.* ¶ 16. The cloud marketplace system is configured to monitor the cloud computing environments to determine when the resources or services data indicates the occurrence of the event. *Id.* “Upon occurrence of the event, the cloud marketplace system can be configured to migrate the virtual machine or machines to a new cloud computing environment with the resources and services data matching the event.” *Id.*

Figure 3, reproduced below, illustrates a network configuration for a cloud management system.

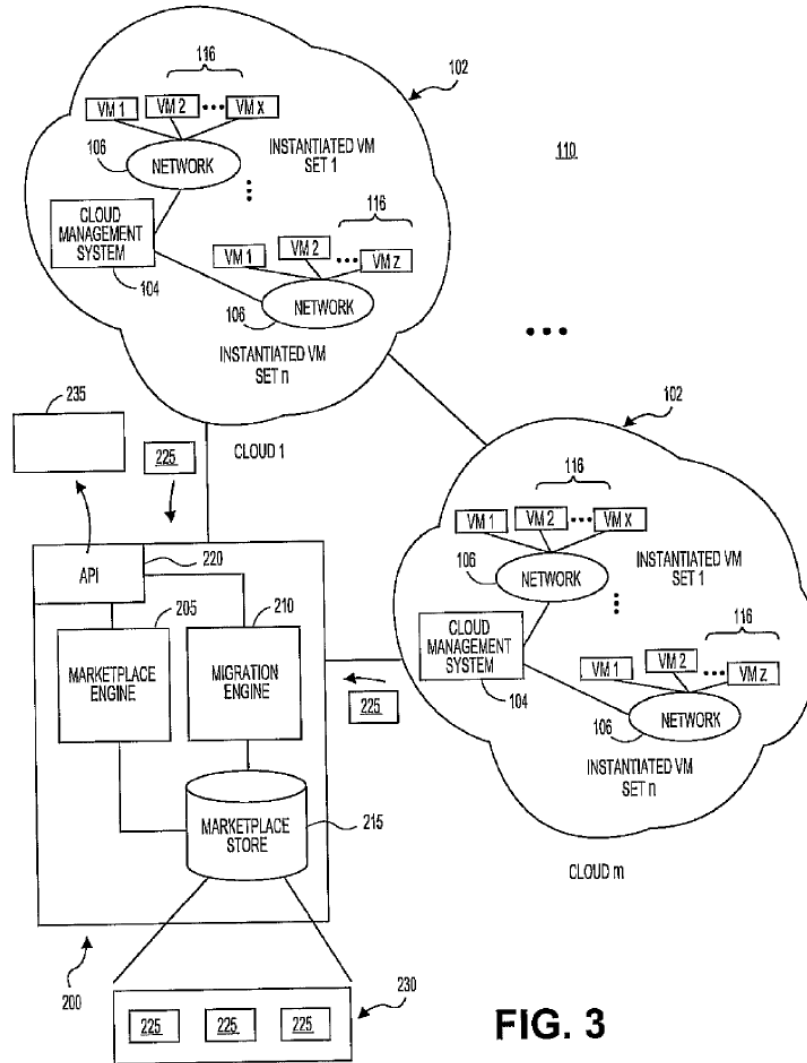


FIG. 3

Figure 3 illustrates cloud marketplace system 200 and its interaction with clouds 102, including cloud management systems 104, networks 106, and virtual machines 116. *Id.* ¶¶ 18, 19, 26, 35.

Cloud marketplace system 200 is configured to utilize resource and service data to provide automatic migration services for virtual machines initiated in the clouds 102. *Id.* ¶ 51. “[T]he cloud marketplace system 200 can be configured to receive a request to monitor the resource and service data 225 of the clouds 102 for the occurrence of a particular event.” *Id.* ¶ 52. “For example, a user can request that the cloud marketplace system 200

migrate a virtual machine or machines when a particular computing resources at a specified cost becomes available in one of the clouds 102.” *Id.*

3. *Independent Claim 1*

a) *The Preamble*

The preamble of claim 1 recites a “method to manage resources in a cloud computing environment, comprising.” Petitioner asserts, “[t]o the extent the preamble is limiting,” that Xu teaches the preamble. Pet. 20-21 (citing Ex. 1002 ¶¶ 137–150). Petitioner asserts, similar to the preamble, Xu “describes methods for managing computing resources used by VMs running in datacenters.” *Id.* at 21 (citing, e.g., Ex. 1005, 1). Petitioner also asserts that Xu “describes its own techniques for ‘manag[ing] the dynamic mapping of VMs to physical resources,’ which involve assessing resource usage and migrating VMs to different computers.” *Id.* (citing Ex. 1005, 1–7). Relying on the testimony of Dr. Zadok, Petitioner also asserts that a person having ordinary skill in the art “would have recognized Xu’s techniques as intended for cloud computing.” *Id.* (citing Ex. 1002 ¶¶ 146–149).

We preliminarily find that Petitioner’s contentions are supported sufficiently by the cited portions of the asserted art. 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 Xu teaches the preamble for purposes of institution.

b) *Element 1.1*

Element 1.1 recites “determining a consumption rate of cloud resources by one or more virtual machines (VMs), the determining based on monitoring at least one of processor usage, memory usage, or input/output (I/O) access rates for the one or more virtual machines in the cloud

computing environment.” Petitioner asserts that “Xu explicitly describes monitoring processor ‘CPU [i.e., processor usage], disk [i.e., memory usage] and network IO usage [i.e., input/output access rates].” Pet. 25 (citing Ex. 1005, 3–6, Tables 1, 2). Relying on the testimony of Dr. Zadok, Petitioner asserts that a person having ordinary skill in the art “would have understood each of these periodically assessed values—including CPU usage, memory usage, and I/O access rates—to be a ‘consumption rate’ as that term is used in the ’134 Patent.” *Id.* at 23 (citing Ex. 1001, 5:51–58; Ex. 1002 ¶ 160). Petitioner asserts that “Xu expressly describes the underlying monitoring that provides the basis for its resource-consumption rates, noting ‘multiple sensors for monitoring **resource usage**, power consumption and temperature of server nodes, as well as resource utilization of individual VMs hosted on those nodes.’” *Id.* at 24–25 (citing Ex. 1005, 2, 5–6; Ex. 1002 ¶¶ 163–164).

We preliminarily find that Petitioner’s contentions are supported sufficiently by the cited portions of the asserted art. After consideration of the contentions and the evidence of record at this early stage, we determine that Petitioner has shown sufficiently that Xu teaches element 1.1 for purposes of institution.

c) Element 1.2

Element 1.2 recites “prioritizing the one or more VMs for consumption of the cloud resources using a first resource management scheme based, at least in part, on the determined consumption rate.” Petitioner asserts that Xu teaches “four resource management schemes, including Thermal Emergency,” “CPU Resource Contention,” “IO Resource Contention,” and “Network Resource Contention.” Pet. 26 (citing, e.g., Ex. 1005, Table 2). Petitioner relies on Xu’s teachings that if a thermal

emergency condition is detected “VMs on the identified server are sorted in decreasing order of the ratio of their CPU utilization to memory size (USR).” Ex. 1005, 3 (quoted in Pet. 26). Petitioner alternatively relies on Xu’s teachings that if a resource contention condition is detected

[o]n the identified server, each VM’s utilization of the resource under pressure is retrieved and the average value of all VMs’ utilization is calculated. Only the VMs with utilization higher than the average are considered to be competing VMs and others are filtered out. Also considering the migration cost, the competing VMs are further ordered in increasing order of their memory size.

Ex. 1005, 3 (cited in Pet. 27–28).

We preliminarily find that Petitioner’s contentions are supported sufficiently by the cited portions of the asserted art. After consideration of the contentions and the evidence of record at this early stage, we determine that Petitioner has shown sufficiently that Xu teaches element 1.2 of claim 1 for purposes of institution.

d) Element 1.3

Element 1.3 recites “determining whether a change in the consumption rate of the cloud resources exceeds a predetermined threshold, the change in the consumption rate including a change in the at least one of processor usage, memory usage, I/O access rates, or a change region size based on changed regions of a graphical display generated by the one or more VMs.” Petitioner asserts “Xu’s periodic monitoring of the consumption rates continues” and “subsequent iteration of Xu’s ‘resource contention’ scheme satisfies element 1.3.” Pet. 29 (citing Ex. 1005, 2, 5–6). Petitioner asserts, “[w]hen evaluating resource contention, Xu uses a two-stage detection process that evaluates whether consumption rates exceed predetermined thresholds,” i.e., $TH_{\text{level-1}}$ and $TH_{\text{level-2}}$. *Id.* (citing, e.g.,

Ex. 1005, 2–6). Xu describes “[f]or resource contention, we set 85% and 90% as two-level utilization thresholds for CPU, IO and network.” Ex. 1005, 5.

We preliminarily find that Petitioner’s contentions are supported sufficiently by the cited portions of the asserted art. After consideration of the contentions and the evidence of record at this early stage, we determine that Petitioner has shown sufficiently that Xu teaches element 1.3 of claim 1 for purposes of institution.

e) Element 1.4

Element 1.4 recites the following:

prioritizing the one or more VMs for consumption of the cloud resources using a second resource management scheme based, at least in part, on a maximum capacity for utilization of allowed cloud resources for the cloud computing environment and whether the determined change in the consumption rate of the cloud resources exceeds the predetermined threshold.

Petitioner asserts Xu teaches “[i]f both alarms of Xu’s two-level detection are triggered, Xu ‘prioritizes the VMs for consumption of the cloud resources’ according to its resource-contention scheme (i.e., ‘using a second resource management scheme’).” Pet. 32. Petitioner relies on Xu’s filtering and ordering of VMs according to the criteria discussed with respect to element 1.2. *Id.* at 32–35 (citing, e.g., Ex. 1005, 2–3, 5; Ex. 1002 ¶¶ 157, 188–194).

Petitioner also contends “to the extent Patent Owner argues that the recited ‘maximum capacity’ must be for the cloud environment as a whole (not just an individual server), Xu in view of Ferris teaches this as well.” *Id.* at 33. Petitioner relies on Ferris’s teachings of a controller accessing status data and computing resources and services available in the cloud computing

environment and triggering external migration when a threshold value is reached. *Id.* (citing, e.g., Ex. 1006 ¶¶ 12, 51–52, 65). Petitioner asserts that extending Xu’s teachings of analysis and monitoring “for the cloud environment as a whole” would have been a “predictable, straightforward application of Ferris teachings” and “would have allowed Xu to migrate VMs to a separate cloud environment when it encounters cloud-wise resource scarcity.” *Id.* at 37 (citing, e.g., Ex. 1002 ¶¶ 207–219). Petitioner also asserts a person having ordinary skill in the art “would have recognized that the ability to move VMs to other cloud environments was advantageous, as it would provide a safety valve ensuring that VMs still have access to sufficient resources even if the current cloud environment becomes overloaded.” *Id.* at 38 (citing, e.g., Ex. 1002 ¶ 213). Petitioner further asserts that its proposed combination would have been viewed as a reasonable way to achieve balancing objectives. *Id.* at 38–39 (citing, e.g., Ex. 1002 ¶ 214; Ex. 1005, 1).

We preliminarily find that Petitioner’s contentions are supported sufficiently by the cited portions of the asserted art. 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 Xu and Ferris in the manner proposed by Petitioner. After consideration of the contentions and the evidence of record at this early stage, we determine that Petitioner has shown sufficiently that Xu alone or with Ferris teaches element 1.4 of claim 1 for purposes of institution.

f) Element 1.5

Element 1.5 recites the following:

migrating the consumption of the cloud resources to alternate cloud resources located outside of the cloud computing environment for at least one of the one or more VMs based, at least in part, on the one or more VMs prioritized for consumption of the cloud resources using the second resource management scheme.

Petitioner points to Xu's teachings of triggering migration to the selected host. Pet. 35–36 (citing Ex. 1005, 3–6; Ex. 1002 ¶¶ 201–203). Petitioner relies on Ferris's teachings that multiple cloud computing environments are available to its migration services. *Id.* at 36 (citing, e.g., Ex. 1006 ¶¶ 12, 16, 60–66, Fig. 3). Petitioner relies on its reasoning to combine discussed with respect to element 1.4. *Id.* at 36.

We preliminarily find that Petitioner's contentions are supported sufficiently by the cited portions of the asserted art. 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 Xu and Ferris in the manner proposed by Petitioner. 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 Xu and Ferris teaches element 1.5 of claim 1 for purposes of institution.

g) 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 Xu and Ferris 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 Xu and Ferris 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 Xu and Ferris.

4. *Independent Claims 7 and 13*

Independent claim 7 is similar to independent claim 1, except claim 7 further recites a “machine-readable non-transitory medium having stored therein instructions.” Independent claim 13 also is similar to claim 1, except claim 13 recites a “system” comprising elements such as “a processor” and “a machine-readable non-transitory medium having stored therein instructions.” We preliminarily find that Petitioner accounts for all differences between claims 1, 7, and 13. Pet. 40–49.

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 Xu and Ferris teaches each recitation of claims 7 and 13 for purposes of institution. Also, at this juncture, we are persuaded that Petitioner has articulated a 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 Xu and Ferris 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 7 and 13 are unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Xu and Ferris.

5. *Dependent Claims 5, 11, and 17*

We have considered Petitioner's arguments and evidence for dependent claims 5, 11, and 17 and are persuaded that Petitioner has shown sufficiently that the combination of Xu and Ferris 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 5, 11, and 17 are unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Xu and Ferris.

E. *Unpatentability of Claims 2–4, 6, 8–10, 12, 14–16, and 18 under 35 U.S.C. § 103(a) as Obvious over Xu, Ferris, and van Riel*

Petitioner asserts that claims 2–4, 6, 8–10, 12, 14–16, and 18 are unpatentable as obvious over Xu, Ferris, and van Riel. Pet. 3. We begin with an overview of van Riel. We then turn to Petitioner's contentions.

1. *van Riel*

van Riel relates to tuning a cache that is resident in computer memory. Ex. 1007 ¶ 2. van Riel explains that when a computer cache is full, before a new memory page can be brought into the cache, another page (known as the victim page) must be evicted. *Id.* ¶ 6. The victim page is selected by a replacement algorithm. *Id.* van Riel describes “[s]everal replacement algorithms are well known to those skilled in the art includes Least Recently Used (LRU)” and “Low Inter[-]reference Recency Set (LIRS).” *Id.* van Riel further discloses that its method “may be implemented in a computer system that supports multiple virtual machines.” *Id.* ¶ 72.

2. *Dependent Claims 2–4, 6, 8–10, 12, 14–16, and 18*

We have considered Petitioner's arguments and evidence for dependent claims 2–4, 6, 8–10, 12, 14–16, and 18 and are persuaded that

Petitioner has shown sufficiently that the combination of Xu, Ferris, and van Riel 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 2–4, 6, 8–10, 12, 14–16, and 18 are unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Xu, Ferris and van Riel.

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 1–18 of the '134 patent are unpatentable.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that *inter partes* review of claims 1–18 of the '134 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.

IPR2022-01168
Patent 9,635,134 B2

FOR PETITIONER:

Jordan M. Rossen
Alyssa Holtslander
UNIFIED PATENTS, LLC
jordan@unifiedpatents.com
alyssa@unifiedpatents.com

FOR PATENT OWNER:

Sanjay Pant
PRALAW
spant@pralawllc.com

Gautham Bodepudi
gbodepudi@outlook.com