

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MICROSOFT CORPORATION,
Petitioner,

v.

DAEDALUS BLUE, LLC,
Patent Owner.

IPR2021-00830
Patent 8,572,612 B2

Before SALLY C. MEDLEY, HYUN J. JUNG, and
ARTHUR M. PESLAK, *Administrative Patent Judges*.

PESLAK, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

Petitioner, Microsoft Corporation, filed a Petition (Paper 1, “Pet.”) requesting an *inter partes* review of claims 1–15 (the “challenged claims”) of U.S. Patent No. 8,572,612 B2 (Ex. 1001, “the ’612 patent”). Petitioner filed a Declaration of Markus Jakobsson, Ph.D. in support of the Petition. Ex. 1003. Patent Owner, Daedalus Blue, LLC, timely filed a Preliminary Response (Paper 6). We instituted this *inter partes* review as to all challenged claims and all grounds presented in the Petition. Paper 11 (“Dec.”).

During the course of trial, Patent Owner filed a response to the Petition. Paper 22 (“PO Resp.”). Patent Owner filed a Declaration of Dr. Christopher Jules White in support of the Patent Owner Response. Ex. 2011. Petitioner filed a Reply to the Patent Owner Response. Paper 25 (“Pet. Reply”). Petitioner filed a Reply Declaration of Markus Jakobsson, Ph.D. in support of the Petitioner Reply. Ex. 1032. Patent Owner filed a Sur-Reply. Paper 28 (“Sur-reply”). An oral hearing was held on August 10, 2022 and a transcript has been entered into the record. Paper 35 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This is a Final Written Decision under 35 U.S.C. § 318(a) as to the patentability of the challenged claims of the ’612 patent. For the reasons discussed below, we determine Petitioner establishes by a preponderance of the evidence that all challenged claims are unpatentable.

A. Related Matters

The parties state that the ’612 patent is asserted in *Daedalus Blue, LLC v. Microsoft Corp.*, No. 6-20-cv-01152 (W.D. Tex.). Pet. 4; Paper 4, 2. The parties also state that the ’612 patent has been involved in *Daedalus*

Blue, LLC v. Oracle Corporation et al., No. 6:20-cv-00428-ADA (W.D. Tex.) (terminated July 24, 2020).

B. Real Parties in Interest

Petitioner identifies itself as the only real party-in-interest. Pet. 3. Patent Owner identifies Daedalus Group LLC as the real party-in-interest, and states that “Daedalus Blue, LLC is a wholly-owned subsidiary of Daedalus Group LLC.” Paper 4, 2.

C. The ’612 Patent

The ’612 patent is titled “Autonomic Scaling of Virtual Machines in a Cloud Computing Environment.” Ex. 1001, code (54). The ’612 patent issued on October 29, 2013, from an application filed on April 14, 2010. *Id.* at codes (45), (22).

The ’612 patent relates to data processing and, more specifically, “methods, apparatus, and products for autonomic scaling of virtual machines in a cloud computing environment.” Ex. 1001, 1:9–11. The ’612 patent explains that although cloud computing is “a cost effective means of delivering information technology services through a virtual platform rather than hosting and operating the resources locally,” one problem is that the end user “loses all control over the underlying hardware infrastructure.” *Id.* at 1:28–42. In particular, the end user loses “control over scaling the number of virtual machines running an application,” which “is currently carried out manually by a system administrator — only when end users report performance degradation.” *Id.* at 1:41–47. This is problematic because it “is slow and complex” and “inherently risks a user’s experiencing a poor quality of service.” *Id.* at 1:41–49.

In order to address that problem, the ’612 patent describes “autonomic scaling” of virtual machines, which “refers to an ability of a cloud

computing environment to manage its own scaling operations with little or no governance by hand from any user or system adminis[trator].” Ex. 1001, 2:38–41. In particular, the ’612 patent further describes “autonomic scaling in the sense of adding and removing instances of virtual machines and their data processing applications as data processing workload increases and decreases within a cloud computing environment.” *Id.* at 41–45.

Figure 1 from the ’612 patent is reproduced below:

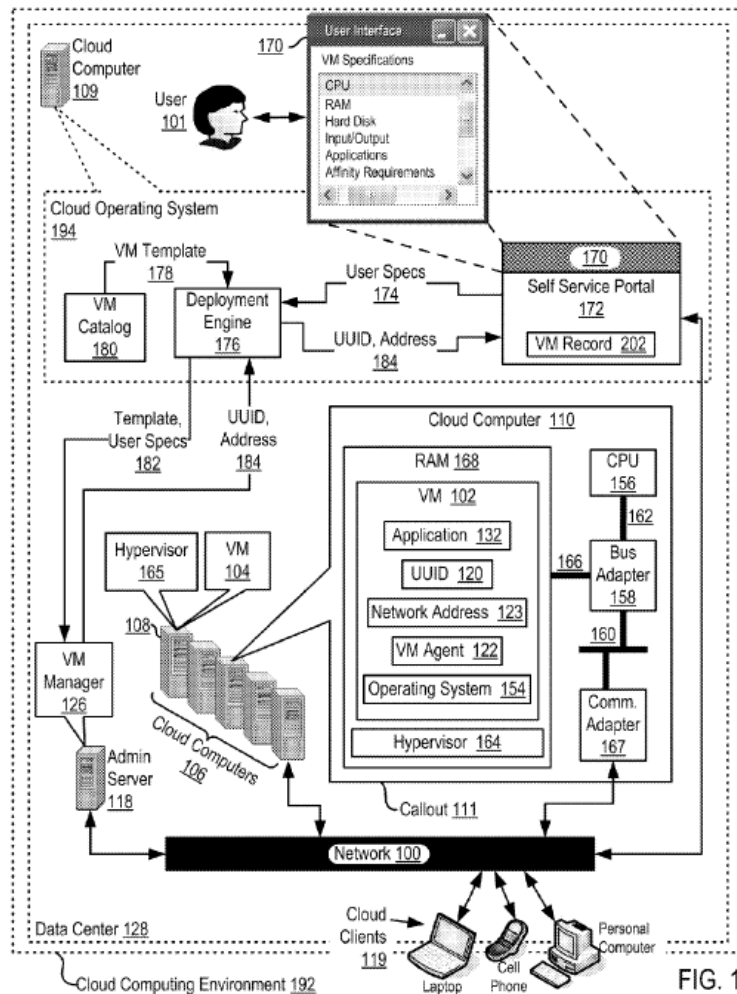


Figure 1 is “a functional block diagram of [an] apparatus that carries out autonomic scaling of virtual machines in a cloud computing environment.” Ex. 1001, 2:50–52. As shown in Figure 1, cloud computing environment 192 includes virtual machines (VMs) 102 and 104, and a

plurality of cloud computers 106 disposed in data center 128, including individual cloud computers 109 and 110. *Id.* at 2:54–56. Each VM is a module of automated computing machinery installed upon a cloud computer. *Id.* at 2:56–58. Data center 128 also includes data center administration server 118, which is operably coupled to VMs in the cloud computing environment through data communications network 100. *Id.* at 4:26–28. Data center administration server 118 provides the data center-level functions of communicating with hypervisors on cloud computers to install VMs, terminate VMs, and move VMs from one cloud computer to another within the data center. *Id.* at 4:29–33.

Cloud operating system 194, operating on one of the cloud computers, comprises several submodules including virtual machine catalog 180, deployment engine 176, and self service portal 172. Ex. 1001, 4:38–44. Self service portal 172 enables authorized users 101 to set up VMs as they wish, via user interface 170, with “no knowledge whatsoever regarding how their VMs are disposed upon the underlying hardware.” *Id.* at 4:45–50, 4:63–66. Through user interface 170, the self service portal 172 receives user specifications 174 of VMs, such as “specifications of computer resources to be provided as the VM, types and numbers of computer processors, quantity of random access memory, hard disk storage, input/output resources, application programs, requirements or specifications for scaling, and so on.” *Id.* at 5:8–12. The cloud operating system 194 then deploys an instance of the specified VM in accordance with the received user specifications. *Id.* at 5:17–20. In the example of Figure 1, the cloud operating system deploys an instance of VM 102 on cloud computer 110. *Id.* at 5:44–46.

Cloud computer 110 includes hypervisor 164, which is “a module of automated computing machinery that supports multiple operating systems running concurrently in separate virtual machines on the same host computer.” Ex. 1001, 6:7–11. Once an instance of VM 102 is implemented by hypervisor 164, VM instance 102 runs application program 132 and operating system 154. *Id.* at 6:25–28. VM instance 102 is configured by the hypervisor to allow application 132 to share the underlying physical machine resources of cloud computer 110, such as CPU 156, RAM 168, communications adapter 167, and so on. *Id.* at 6:30–33. VM 102 has scaling specifications provided as part of its user specifications 174, “thus ‘flagging’ the VM for autonomic scaling in the records maintained by the self service portal.” *Id.* at 7:32–39. In an embodiment, “flagging an instance of a VM for autonomic scaling can include storing, in the cloud operating system in association with an identifier of the instance of a VM, predetermined threshold values of operating characteristics, including threshold values for processor utilization and for memory utilization.” *Id.* at 7:42–47. Cloud operating system 194 monitors one or more operating characteristics of the instance of the VM, and when “a value of an operating characteristic exceeds a first predetermined threshold value,” the cloud operating system “deploys an additional instance of the VM” and executes “a portion of the data processing workload on the additional instance of the VM.” *Id.* at 7:65–8:16. The cloud operating system continues monitoring one or more operating characteristics of the first instance of VM 102, terminating operation of the additional instance 104 of the VM if a value of an operating characteristic declines below a second predetermined threshold value. *Id.* at 8:28–32.

D. Challenged Claims

Claims 1, 6, and 11 are independent. Claim 1 is illustrative and reproduced below:

1. A method of autonomic scaling of virtual machines in a cloud computing environment, the cloud computing environment comprising a plurality of virtual machines ('VMs'), the VMs comprising modules of automated computing machinery installed upon cloud computers disposed within a data center, the cloud computing environment further comprising a cloud operating system and a data center administration server operably coupled to the VMs, the method comprising:

deploying, by the cloud operating system, an instance of a VM, including flagging the instance of a VM for autonomic scaling including termination and executing a data processing workload on the instance of a VM;

monitoring, by the cloud operating system, one or more operating characteristics of the instance of the VM;

deploying, by the cloud operating system, an additional instance of the VM if a value of an operating characteristic exceeds a first predetermined threshold value, including executing a portion of the data processing workload on the additional instance of the VM; and

terminating operation of the additional instance of the VM if a value of an operating characteristic declines below a second predetermined threshold value;

wherein the cloud operating system comprises a module of automated computing machinery, further comprising a self service portal and a deployment engine, and deploying an instance of a VM further comprises:

passing by the self service portal user specifications for the instance of a VM to the deployment engine;

implementing and passing to the data center administration server, by the deployment engine, a VM template with the user specifications; and

calling, by the data center administration server, a hypervisor on a cloud computer to install the VM template as an instance of a VM on the cloud computer.

Ex. 1001, 15:42–16:8.

E. Prior Art and Asserted Ground

Petitioner asserts that claims 1–15 would have been unpatentable on the following ground (Pet. 1–2):

Claims Challenged	35 U.S.C. ¹ §	References/Basis
1–15	103(a)	Keagy, ² Miller, ³ and the knowledge of a person of ordinary skill in the art (“POSITA”)

II. ANALYSIS

A. Overview

Petitioner bears the burden of establishing the unpatentability of the challenged claims by a preponderance of the evidence. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). This burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

A claim is unpatentable under § 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.

¹ The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), included revisions to 35 U.S.C. § 103 that became effective after the effective filing date of the challenged claims. Therefore, we apply the pre-AIA version of 35 U.S.C. § 103.

² U.S. Patent No. 10,365,935 B1, iss. July 30, 2019 (Ex. 1005) (“Keagy”).

³ U.S. Patent No. 8,296,434 B1, iss. Oct. 23, 2012 (Ex. 1006) (“Miller”).

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) when in evidence, objective indicia of non-obviousness (i.e., secondary considerations).⁴ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

The level of ordinary skill in the art is “a prism or lens” through which we view the prior art and the claimed invention. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). The person of ordinary skill in the art is a hypothetical person presumed to have known the relevant art at the time of the invention. *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). In determining the level of ordinary skill in the art, we may consider certain factors, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *Id.*

Petitioner contends that an ordinary skilled artisan “would have had a bachelor’s degree in computer science, computer engineering, or a related discipline and three years of experience in the relevant technical field—cloud computing, computer networks and systems—or the equivalent.” Pet. 18 (citing Ex. 1003 ¶ 48). Petitioner further states that “[a] POSITA also would have been aware of and generally knowledgeable about the structure

⁴ The parties have not introduced any evidence concerning secondary considerations.

and operation of VMs and different types of hypervisors” and “[h]igher levels of education may substitute for less experience, and vice versa.” *Id.* at 18–19. Patent Owner applies Petitioner’s proposed level of ordinary skill in the art. *See* PO Resp. 8.

We apply Petitioner’s proposed level of ordinary skill in the art because it comports with the level of skill reflected in the ’612 patent and the prior art of record.

C. Claim Construction

We apply the same claim construction standard used by Article III federal courts and the International Trade Commission, both of which follow *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc), and its progeny. 37 C.F.R. § 42.100(b) (2021). Accordingly, we construe each challenged claim of the ’612 patent to generally be “the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” *Id.*

i. flagging the instance of a VM for autonomic scaling including termination

Petitioner contends that the limitation of “flagging the instance of a VM for autonomic scaling” should be construed to mean “adding a marker to the configuration information for a particular VM occurrence indicating whether that VM occurrence is to be autonomically scaled.” Pet. 16 (citing Ex. 1003 ¶¶ 88–92). Petitioner points to the claim language as “illustrating that the flagging information for a given VM occurrence is associated with that individual VM occurrence.” *Id.* Petitioner further contends that the Specification “describes ‘flagging’ as ‘storing’ data indicative of autonomic scaling (for example, ‘predetermined threshold values of operating characteristics’) ‘in the cloud operating system in association with an

identifier (204) of the instance of a VM.” *Id.* at 17 (citing Ex. 1001, 9:47–53; Ex. 1003 ¶¶ 89–90). According to Petitioner, “the OS stores an indicator in that VM instance’s underlying code to indicate that the VM instance, once deployed, should be subject to scaling.” *Id.*

In our Decision on Institution, we did not adopt Petitioner’s proposed construction of flagging. Dec. 12. Instead, we applied “the plain and ordinary meaning of ‘flagging,’ consistent with the Specification of the ’612 patent as an ‘indicator’ that the VM instance will be subject to autonomic scaling.” *Id.*

Patent Owner does not address the plain and ordinary meaning that we articulated in the Decision on Institution. *See* PO Resp. 11–15. Patent Owner’s claim construction contentions focus on “termination.” *Id.* at 11. Patent Owner contends “the ‘flag’ must indicate that the instance of a VM is amenable to autonomic termination.” *Id.* (citing Ex. 2011 ¶¶ 47–51). Patent Owner contends that “[t]he 612 Patent’s specification defines that the autonomic scaling in the claimed inventions relates to adding and removing VM instances.” *Id.* In support of this contention Patent Owner points to the statement in the ’612 patent that “[t]his paper describes autonomic scaling in the sense of adding and removing instances of virtual machines and their data processing applications as data processing workload increases and decreases.” *Id.* (citing Ex. 1001, 2:41–45; Ex. 2011 ¶ 50). Patent Owner further contends “[t]hat express statement of intent to use a specific sense of the term autonomic scaling—one that involves adding and removing instances of virtual machines—means that the patentee’s more specific sense governs.” *Id.* at 11–12 (citing *Kyocera Senco Indus. Tools, Inc. v. Int’l Trade Comm’n*, 22 F.4th 1369 (Fed. Cir. 2022)).

Patent Owner contends the Specification “consistently describes that instances are removed via termination.” PO Resp. 13 (citing Ex. 1001, 8:28–38, 10:21–38, 11:18–27, 12:12–21). Patent Owner further contends “during prosecution, the applicant amended the pending independent claims’ ‘autonomic scaling’ to ‘autonomic scaling including termination.’” *Id.* (citing Ex. 1002, 103, 106, 109, 112–114). Patent Owner further contends “the ‘flag’ in ‘flagging the instance of a VM for autonomic scaling’ must indicate that the instance of a VM is amenable to autonomic termination.” *Id.* at 13–14. Patent Owner argues that the construction should include the phrase “amenable to” because the applicant argued that the claims distinguish over a prior art reference namely “Yach’s flag, however, does not indicate whether the virtual machine is amenable to ‘autonomic scaling including ‘termination’ as claimed here.” *Id.* at 14 (quoting Ex. 1002, 74).

In the Petitioner Reply, Petitioner does not dispute the plain and ordinary meaning that we articulated in the Decision on Institution. *See* Pet. Reply 5–8. Rather, Petitioner contends Patent Owner “seeks to improperly insert a concept of being ‘amenable to autonomic termination’ that appears nowhere in the claims or specification.” *Id.* at 5. Petitioner directs us to the Specification’s use of “the term ‘[a]utonomic scaling’ to mean ‘an ability of the cloud computing environment to manage its own scaling operations with little or no governance by hand from any user or system administer [sic].’” *Id.* at 6 (citing Ex. 1001, 2:38–41). Petitioner directs us to the language of claim 1 where it recites “terminating operation of the additional instance of the VM” to support its contention a skilled artisan would understand that “the correct meaning for ‘termination’ is ‘terminating operation’ of the VM, not necessarily removing it entirely from existence.” *Id.* at 7 (citing Ex. 1001, 15:61–63; Ex. 1032 ¶¶ 11, 13). Petitioner further cites to

dependent claim 5 and the Specification in support of its contention that terminating operation of the VM is “the correct meaning for ‘termination.’” *Id.* (citing Ex. 1001, 8:28–32, claim 5; Ex. 1032 ¶¶ 11, 13, 14). Petitioner further contends that when distinguishing Yach, the “patentee simply stated that Yach’s flag could not be ‘for autonomic scaling including termination’ but did not “state[] that the claimed flag must indicate that the VM instance is ‘amenable’ to autonomic termination.” *Id.* at 8 (citing Ex. 1002, 174).

Our analysis starts with the claim language. The phrase at issue is “deploying . . . an instance of a VM for autonomic scaling including flagging the instance of a VM for autonomic scaling including termination.” Ex. 1001, 15:50–52. Claim 1 also recites “deploying . . . an additional instance of the VM” and “terminating operation of the additional instance of the VM.” *Id.* at 15:56–61.

Much of the parties’ dispute revolves around whether we should substitute the words “amenable to autonomic” for the second instance of “including” prior to “termination” in the limitation “deploying . . . an instance of a VM.” *See* Pet. Reply 6 (providing a table comparing the claim language to Patent Owner’s construction); Sur-reply 4–5.

The words ‘amenable to’ do not appear in the Specification in connection with describing autonomic termination. During the oral hearing, Patent Owner stated that “amenable to” means “[t]he flag needs to indicate that the virtual machine can be autonomically terminated.” Tr. 25:20–22. Consequently, we perceive no difference between the actual claim language of including termination and “amenable to” termination and decline to incorporate “amenable to” in our construction.

The crux of the parties’ dispute is the construction of “termination.” Patent Owner contends autonomic scaling “involves adding and removing

instances of virtual machines.” PO Resp. 11. From this construction, Patent Owner argues that “termination” means “removing the flagged instance of a VM.” *See id.* at 17. Petitioner counters that “the correct meaning for ‘termination’ is ‘terminating operation’ of the VM, not necessarily removing it entirely from existence.” Pet. Reply 7.

For the following reasons, we determine that “termination” in claim 1 includes both termination by removing an instance of a virtual machine and terminating operation of the VM.

The Specification of the ’612 patent provides the following relevant disclosure:

‘Autonomic’ refers to an ability for a cloud computing environment to manage its own operations with little or no governance by hand from any user or system administrator. ‘Autonomic scaling’ therefore refers to an ability of a cloud computing environment to manage its own scaling operations with little or no governance by hand from any user or system administrator. This paper describes autonomic scaling in the sense of adding and removing instances of virtual machines and their data processing applications as data processing workload increases and decreases with a cloud computing environment.
Ex. 1001, 2:35–45.

Patent Owner’s contentions revolve around using the last sentence quoted above to limit the broader definition of autonomic scaling set forth in the prior sentence. PO Resp. 11–12 (arguing “[t]hat express statement to use a specific sense of the term autonomic scaling—one that involves adding and removing instances of virtual machines—means that the patentee’s more specific sense governs.”).

The Federal Circuit instructs us that “[t]he patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.”

Ficosa N. Am. Corp., 299 F.3d 1313, 1325 (Fed.Cir.2002). In this case, the last sentence quoted above stating the patentee’s “sense” refers to “removing” instances of a VM but we find no support for determining that it is “a manifest exclusion or restriction representing a clear disavowal of claim scope.”

Patent Owner’s reliance on *Kyocera Senco Indus. Tools Inc. v. Int’l Trade Comm.*, 22 F. 4th 1369 (Fed. Cir. 2022) for the proposition that “the patentee’s more specific sense governs” (PO Resp. 11–12) is unavailing. In *Kyocera*, the Federal Circuit, in reviewing the ITC’s construction of the term “driven position,” looked to the specification’s description of the term and found “[n]othing about this statement suggests the ‘bottom position’ is merely an example of a driven position. It is *the* driven position.” *Id.* at 1378. In this case, the Specification of the ’612 patent does not limit the meaning of “termination” to “removing” the VM entirely. The Specification provides “[t]he cloud operating system continues monitoring one or more operating characteristics of the first instance of the VM (102), *terminating operation* of the additional instance (104) of the VM if a value of an operating characteristic declines below a second predetermined threshold value.” Ex. 1001, 8:28–32 (emphasis added); *see also id.* at 10:21–22 (“terminating . . . operation of the additional instance”); 11:24–25 (“terminating . . . operation of the additional instance”); 12:18–19 (“terminating . . . operation of the additional instance of the VM”). The Specification, thus, suggests that “terminate” does not require “removal” of the VM but includes “terminating operation” of a VM.

Patent Owner’s analysis studiously avoids the language in claim 1 itself reciting “terminating operation of the additional instance of the VM” as well as the language of claim 5 where “terminating operation” appears to

be used interchangeably with “terminate.” *See generally* PO Resp. 11–15; Sur-reply 4–8. Claim 5 which depends from claim 1, recites, *inter alia* “*terminating operation* of the additional instance of the VM” by “transmitting . . . an instruction to *terminate* the additional instance of the VM.” Ex. 1001, 16:48–53 (emphasis added). Thus, the interchangeable use of “terminating operation” with “terminate” in claim 5 suggests that “terminating operation” of a VM is one way to “terminate” a VM. *See Trustees of Columbia Univ. in City of New York v. Symantec Corp.*, 811 F.3d 1359, 1370 (Fed. Cir. 2016) (“[I]n a situation where dependent claims have no meaningful difference other than an added limitation, the independent claim is not restricted by the added limitation in the dependent claim. In such situations, *construing the independent claim to exclude material covered by the dependent claim would be inconsistent.*”) (emphases added) (citations omitted); *Littelfuse, Inc. v. Mersen USA EP Corp.*, 29 F.4th 1376, 1380 (Fed. Cir. 2022) (“By definition, an independent claim is broader than a claim that depends from it, so if a dependent claim reads on a particular embodiment of the claimed invention, the corresponding independent claim must cover that embodiment as well.”).

Claim 1 is directed to a method of autonomically scaling virtual machines and specifically recites “terminating operation” of “the additional instance of the VM.” Therefore, based on the language of claim 1 and the other intrinsic evidence, we determine that “termination” includes both removing the instance of a VM as Patent Owner asserts and terminating operation of a VM as Petitioner asserts.

- ii. *Deploying by the cloud operating system an instance of a VM and an additional instance of a VM*

Patent Owner contends that these limitations should be construed as “creating by the cloud operating system, a new instance of a VM” and “creating by the cloud operating system, a new additional instance of the VM.” PO Resp. 8 (citing Ex. 2011 ¶¶ 37–46). In support of this construction, Patent Owner contends the Specification of the ’612 patent “describes that the cloud operating system’s deployment process yields a ‘new instance of the VM.’” *Id.* at 9 (citing Ex. 1001, 5:17–41, 6:64–65; Ex. 2011 ¶¶ 39–43). Patent Owner further contends that claims 1, 6, and 11 recite “among other limitations ‘*calling*, by the data center administration server, a hypervisor on a cloud *computer to install the VM template as an instance of a VM on the cloud computer.*’” *Id.* (citing Ex. 1001, claims 1, 6, 11). Patent Owner contends that deploying an additional instance of a VM should be similarly construed as “creating, by the cloud operating system, a new instance of the VM.” *Id.* at 10. Patent Owner further contends the Petition states “when the cloud operating system deploys a VM, ‘the OS creates a new VM.’” *Id.* at (citing Pet. 11).

Petitioner, in turn, contends that Patent Owner improperly proposes changing the word “deploy” to “create” and inserting the word “new” into the claims. Pet. Reply 3. Petitioner contends the plain meaning of “‘deploy’ is: ‘bring into effective action’” while the plain meaning of “create” “is ‘bring (something) into existence.’” *Id.* (citing Ex. 1031, 3, 4). Petitioner further contends “the concept of ‘creating’” is nowhere recited in the claims. *Id.* at 3–4 (citing Ex. 1001, claims 1, 6, 11; Ex. 1032 ¶ 22). Petitioner further contends the Specification “consistently uses the term ‘deploy’ or ‘deploying’ to describe the process of setting up a VM.” *Id.* at 4 (citing Ex. 1001, 9:38–44, 9:64–10:2, 12:12–21, 13:9–18). Petitioner also contends that “the term ‘create’ appears only once in the specification and is not used

in relation to deployment of VMs.” *Id.* (citing Ex. 1001, 14:61). Petitioner contends the Specification “describes, to set up a VM a user provides a VM specification to a ‘deployment engine,’ which selects an existing VM template from a VM catalog and installs the VM in accordance with the template.” *Id.* (citing Ex. 1001, 5:17–36, 9:38–46, Fig. 2).

Patent Owner responds that Petitioner’s arguments, based on the Specification, support Patent Owner’s construction because of Petitioner’s use of words such as repeatedly or consistently. Sur-reply 2–3. According to Patent Owner, “[t]he adverbs ‘consistently’ and ‘repeatedly’ have claim construction consequences” that “inform the ordinary meaning of that term when it appears in the claims—even in the absence of express lexicography or disavowal.” *Id.* at 3 (citing *In re Smith Int’l, Inc.*, 871 F. 3d 1375, 1383 (Fed. Cir. 2017)).

For the following reasons, we do not adopt Patent Owner’s construction of this term.

We start with the language of the claims. The independent claims all use the word “deploying” not “creating.” Ex. 1001, 15:50, 17:3, 18:25. We find nothing in the claim language suggesting that we should change the word “deploying” to “creating.”

We agree with Petitioner that the common meaning of “deploying,” bringing into effective action, is different than the common meaning of “creating,” bringing something into existence. Ex. 1031, 3, 4. We turn to the Specification of the ’612 patent for guidance on the meaning of “deploying” in order to determine if we should deviate from the common meaning of deploying. The Specification repeatedly refers to “deploying” an instance or an additional instance of a VM but in none of the references to “deploying” does the Specification require creating a new VM as part of

deploying a VM. *See, e.g.*, Ex. 1001, 5:17–21, 7:50–52, 8:16–22, 9:38–42, 9:64–10:2, 12:12–18, Fig. 2 (step 304). In reviewing the Specification, we perceive no suggestion that “deploying” an instance of a VM or an additional instance of a VM requires the step of first creating a new VM prior to deploying it. The Specification does provide that “[t]he data center administration server (118) provides the data center-level functions of communicating with hypervisors on cloud computers to install VMs, terminate VMs, and *move VM’s from one cloud computer to another within the data center.*” *Id.* at 4:29–33 (emphasis added). This part of the Specification does not support Patent Owner’s contention that “deploying” requires creating a new instance of a VM, but, rather, suggests that an existing VM can be deployed by moving it from one cloud computer to another.

Patent Owner’s contention that because “[t]he ‘new instance of the VM’ also receives a unique identifier” means “that a ‘new instance of the VM’ was created via the deployment process” is unavailing. The ’612 patent discloses that the cloud operating system monitors the operating characteristics of the instances of the VM. Ex. 1001, Fig. 2, step 312. Step 304 in Figure 3 is where the VM instance is deployed and includes storing in the cloud operating system “An Identifier Of The Instance of A VM.” *Id.* The cloud operating system monitors one or more operating characteristics of the VM instance in step 312. *Id.* Regardless of whether the instance of the VM is existing or created prior to step 304, this disclosure suggests the unique identifier is required for the cloud operating system to have knowledge of the operating characteristics of particular instances of a VM in order to know what to monitor in step 312. *See id.* at 7:42–47 (flagging

includes storing “an identifier of an instance of a VM, predetermined threshold values of operating characteristics”).

For all of these reasons, we decline to adopt Patent Owner’s construction because it requires the addition of a step not required in the claims, i.e., creating a new instance of a VM prior to deploying it. Therefore, we apply the plain and ordinary meaning of deploying as bringing, by the cloud operating system, a VM into effective action in the recited method.

iii. Other terms

After reviewing the evidence and arguments presented by the parties, we determine that it is not necessary to our decision to construe any other claim terms. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (noting that “we need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy’”).

D. Ground 1: Alleged Obviousness Over Keagy, Miller, and the Knowledge of a POSITA

Petitioner contends that claims 1–15 are obvious over Keagy, Miller, and the knowledge of a POSITA. Pet. 23–70. In support thereof, Petitioner identifies the disclosures in Keagy and Miller alleged to describe the subject matter in the challenged claims. *Id.* Additionally, Petitioner offers declaration testimony from Markus Jakobsson, Ph.D. (“Jakobsson Declaration”) in support of the Petition. Ex. 1003 ¶¶ 97–209.

1. Keagy

Keagy discloses a hosting service provider that maintains and provisions a grid of hardware nodes that are shared among multiple users.

Ex. 1005, 2:3–5. Keagy explains that a hardware node may include more resources than required by any single user’s server configuration. *Id.* at 2:9–15. Keagy discloses that “[b]y partitioning the resources of a hardware node amongst multiple server configurations, a hosting service provider minimizes the amount of hardware needed to host all such server configurations, while maximizing the usage of the available hardware.” *Id.* at 2:15–20. Keagy discloses that “[v]irtualization provides the means for partitioning the hardware resources amongst the multiple server configurations.” *Id.* at 2:21–23. Keagy explains that “[a]t the core of each virtualization solution is the hypervisor,” which is “also referred to as the virtual machine monitor,” and “manages a logical partitioning of a physical set of hardware resources of a physical device or node between different virtualized guests.” *Id.* at 2:53–57. “The hypervisor partitions underlying hardware resources such that each virtual machine is provided what logically appears as a distinct and unshared set of hardware resources.” *Id.* at 2:59–61.

Figure 9 of Keagy is reproduced below:

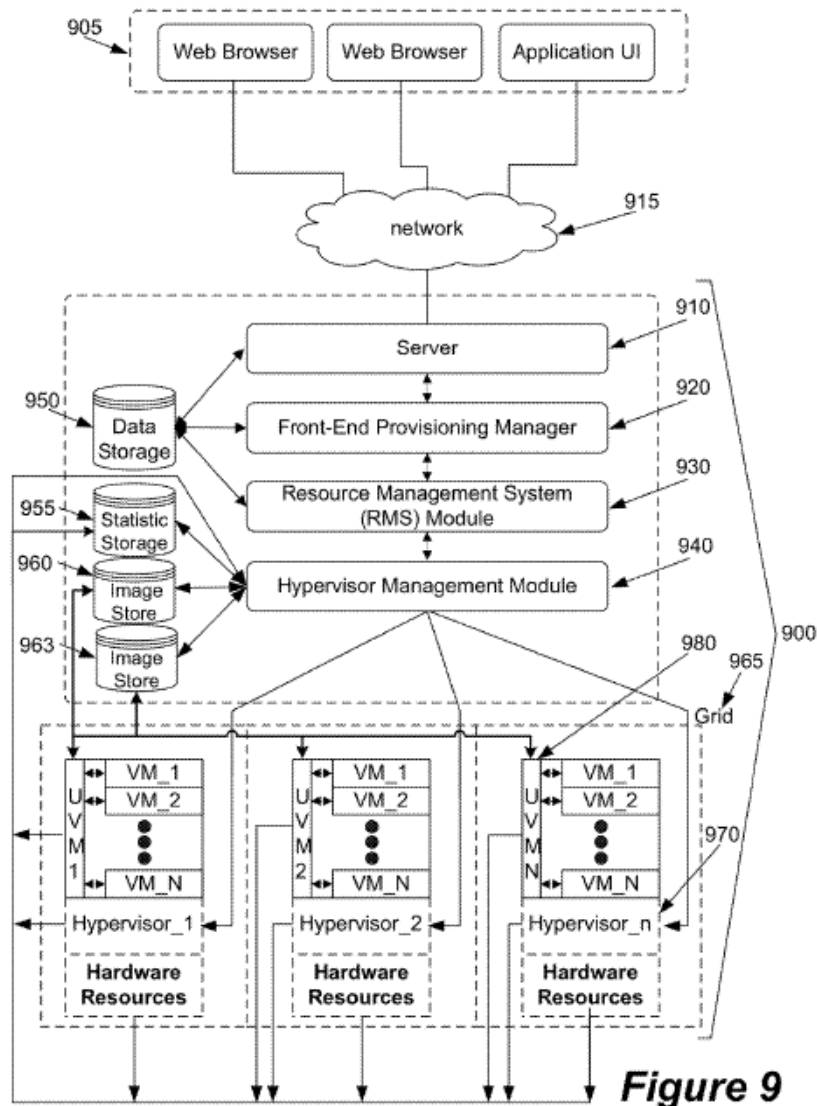


Figure 9 illustrates hosting system 900 that “provides hosting services for multiple unrelated users over the shared grid of hardware nodes.”

Ex. 1005, 17:59–61. Hosting system 900 “automatedly receives new or modified server configurations through front-end user interface (UI) logic and then automatedly deploys the server configuration onto a grid of hardware nodes through back-end placement logic.” *Id.* at 17:52–58. As shown in Figure 9, hosting system 900 includes: (1) service request server 910, (2) front-end provisioning manager 920, (3) resource management

system module 930, (4) hypervisor management module 940, (5) data storage 950, (6) statistics storage 955, (7) operating system image store 960, (8) application image store 963, and (9) grid of hardware nodes 965. *Id.* at 17:61–67.

In operation, service request server 910, (1) receives communications (e.g., service requests) from external users through network 915 and (2) routes the communications to the front-end provisioning manager 920. Ex. 1005, 18:1–4. “The front-end provisioning manager 920 generates a graphical interface through which users specify graphical representations for the various components of the virtual machine configurations hosted by the group of resource nodes within grid 965.” *Id.* at 18:40–44. “In some embodiments, the specified configuration is scalable to increase or decrease allocated resources in response to demand through simple modification of the graphical representation.” *Id.* at 18:66–19:2. “After the graphical specification for the server configuration is complete, some embodiments of front-end manager 920 automatically provide the configuration to the hosting system’s back-end logic, which is formed by resource management system module 930 and hypervisor management module 940.” *Id.* at 19:25–30. “To deploy a configuration, hypervisor management module 940 performs a constraint optimization process by considering a variety of factors that determine on which nodes to deploy the logical assignment of the user-specified configuration.” *Id.* at 19:50–54. The constraint optimization process can consider factors including “(1) the unallocated resources of the hardware nodes, (2) the behavioral characteristics of the specified configuration (e.g., where one web server of a configuration experiences greater loads than a second web server), (3) the behavioral characteristics of the hardware nodes (e.g., performance characteristics of

the hypervisor operating on each node), (4) the individual characteristics associated with each user (e.g., the likelihood that a user configuration will be subject to hacking or spamming), and (5) the internal specific parameters (e.g., software licensing costs).” *Id.* at 19:54–65. Keagy further discloses that “hypervisor management module 940 performs intelligent resource allocation that optimizes the performance of the configuration over the set of hardware nodes 965 and maximizes the number of users able to use nodes 965.” *Id.* at 19:65–20:3.

2. *Miller*

Miller discloses techniques “for providing load balancing capabilities among multiple computing nodes, such as on behalf of a user or other entity.” Ex. 1006, 1:64–66. Miller discloses that the nodes “may have various forms, such as physical computing systems and/or *virtual machines* that are each hosted on one or more physical computing systems.” *Id.* at 25:65–26:2 (emphasis added). In some embodiments, the “load balancing capabilities include dynamically scaling a group of multiple computing nodes for which the load balancing is performed, such as to dynamically expand and/or shrink the quantity of computing nodes in the group based on predefined criteria, or to otherwise modify computing-related resources used by the computing nodes of the group.” *Id.* at 1:66–2:6. Miller discloses a “Dynamic Computing Scaling (‘DCS’) Load Balancer module” that automatically performs load balancing. *Id.* at 2:22–24. In some embodiments, “at least some of the computing nodes of a group for an entity may be part of one or more physical networks in one or more geographical locations under control of the entity, and at least some of the dynamic scaling of the group may use one or more other computing nodes that are part of a remote computer network or otherwise provided by a remote

network-accessible service.” *Id.* at 2:26–34. “[O]ne or more DCS Load Balancer modules for the group may be part of the one or more physical networks and/or may be part of the remote computer network,” for example. *Id.* at 2:34–41.

Figure 2 of Miller is reproduced below:

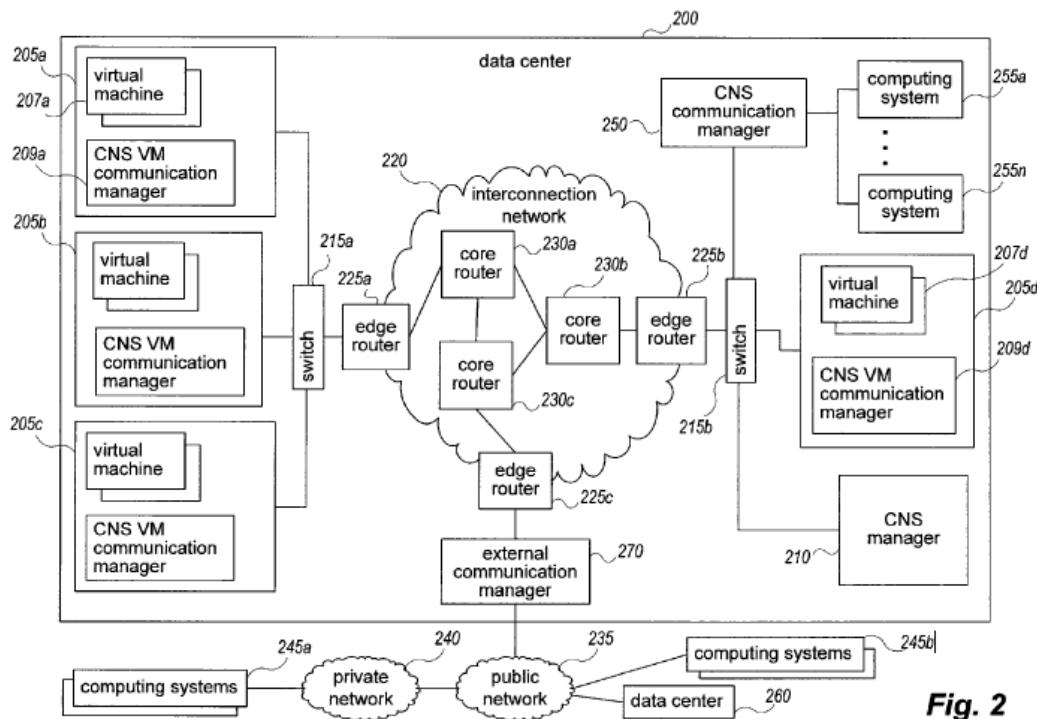


Fig. 2

Figure 2 illustrates “data center 200 with multiple physical computing systems operated by an embodiment of the configurable network service.” Ex. 1006, 18:15–17. In Figure 2, each of physical computing systems 205a–205d host “multiple virtual machine computing nodes and also includes a virtual machine (‘VM’) communication manager module.” *Id.* at 18:62–65. Further, each “virtual machine computing node[] may be used by the configurable network service as a distinct computing node of a computer network provided for a client.” *Id.* at 19:4–6.

3. *Alleged Obviousness of Independent Claim 1*

Petitioner contends that the combined teachings of Keagy and Miller and the knowledge of an ordinary skilled artisan disclose and/or suggest each limitation of claim 1 and also provides reasons why a skilled artisan would have been motivated to combine the teachings of Keagy and Miller. Pet. 23–47, 68–70.

Patent Owner contends that Petitioner has not shown that Keagy and Miller disclose “deploying, by the cloud operating system, an instance of a VM, including flagging the instance of a VM for autonomic scaling including termination and executing a data processing workload on the instance of a VM” (PO Resp. 16–24) and “deploying, by the cloud operating system, an additional instance of the VM if a value of an operating characteristic exceeds a first predetermined threshold value, including executing a portion of the data processing workload on the additional instance of the VM.” (*id.* at 24–33). Patent Owner also contends Petitioner fails to establish a motivation to combine Keagy and Miller. *Id.* at 33–34, 35–41.

[1.PRE]⁵ A method of autonomic scaling of virtual machines in a cloud computing environment, the cloud computing environment comprising

Petitioner contends, to the extent the preamble is limiting, Keagy and Miller both teach methods of autonomically scaling VMs. Pet. 23. Petitioner specifically contends that “Miller teaches a load balancing method that can dynamically (‘autonomically’) scale a group of multiple computing nodes ‘located in various locations’ (i.e., in the cloud) by relying on communications over ‘provided computer networks.’” *Id.* at 23–24

⁵ We use Petitioner’s claim annotations for ease of reference.

(footnote omitted) (citing Ex. 1001, 2:59–66; Ex. 1003 ¶¶ 99, 101; Ex. 1006, 17:11–18:33). Petitioner further contends “Keagy similarly discloses a computing environment for on-demand resource sharing between VMs, where communications between the VMs . . . occur through a networking interface.” *Id.* at 24 (citing Ex. 1005, 40:40–56, 40:66–41:2). Petitioner further contends Keagy calls the “shared resources a ‘cloud’ . . . and a [skilled artisan] would have understood from Keagy’s repeated discussion of network resources associated with VMs and nodes that these components, which must be physically separate, are part of a cloud computing environment.” *Id.* (citing Ex. 1003 ¶¶ 99, 100; Ex. 1005, 2:9–15, 3:3–5, 6:4–8, 13:22–27, 21:57–22:12, 23:17–24:20, 25:54–65, 39:64–40:7).

Patent Owner does not address Petitioner’s contentions concerning this part of the preamble or whether the preamble is limiting. *See generally* PO Resp.

Based on our review of the evidence cited by Petitioner, we find Keagy and/or Miller disclose the subject matter of this part of the preamble.⁶

[1.PRE.i] a plurality of virtual machines (‘VMs’), the VMs comprising modules of automated computing machinery installed upon cloud computers disposed within a data center,

Petitioner contends “Keagy and Miller disclose multiple (‘a plurality of’) VMs.” Pet. 25 (citing Ex. 1005, 9:45–9:47; Ex. 1006, 1:30–42). Petitioner specifically contends Keagy discloses, or renders obvious in view of the knowledge of an ordinary skilled artisan, “cloud computers with ‘modules of automated computer machinery’ . . . by disclosing a computer system embodiment with a bus that ‘communicatively connects’ the

⁶ Because we find Keagy and/or Miller disclose the subject matter of the preamble, we do not address whether the preamble is limiting.

system's internal devices . . . a processor, read and write memory, and a . . . bus to couple the cloud computer to the network.” *Id.* at 25–26 (citing Ex. 1003 ¶¶ 103–108; Ex. 1005, 5:30–54:67, Fig. 31). Petitioner further contends Miller includes similar disclosures. *Id.* at 26 (citing Ex. 1006, 1:26–42, 3:66–4:20, 8:43–9:2, 23:47–58, 28:7–29, Fig. 3).

Patent Owner does not address Petitioner's contentions concerning this part of the preamble. *See generally* PO Resp.

Based on our review of the evidence cited by Petitioner, we find Keagy and/or Miller disclose the subject matter of this part of the preamble.

[1.PRE.ii]: the cloud computing environment further comprising a cloud operating system and a data center administration server operably coupled to the VMs, the method comprising

Petitioner contends “Keagy discloses OSs within its cloud computing environment . . . that are operably coupled to and manage the VMs.” Pet. 27 (citing Ex. 1003 ¶ 111). Petitioner directs us to Keagy's “embodiments that run as applications on a host OS . . . as well as prior art embodiments in which host OSs control hardware resources and make calls that enable VMs to function.” *Id.* (citing Ex. 1003 ¶ 111; Ex. 1005, 3:26–41, 10:1–12, Fig. 3, Fig. 9). Petitioner further contends Keagy discloses “a data center administration server . . . operably coupled to the VMs.” *Id.* at 28 (citing Ex. 1003 ¶ 113; Ex. 1005, 10:13–20, 22:3–63, Fig. 9).

Patent Owner does not address Petitioner's contentions concerning this part of the preamble. *See generally* PO Resp.

Based on our review of the evidence cited by Petitioner, we find Keagy discloses the subject matter of this part of the preamble.

[1.A]: deploying, by the cloud operating system, an instance of a VM, including flagging the instance of a VM for autonomic scaling including

termination and executing a data processing workload on the instance of a VM

Petitioner contends “Keagy discloses deploying new VM instances using the hypervisor management module (‘HMM’), which is part of Keagy’s host OS (i.e., cloud OS).” Pet. 29 (footnote omitted) (citing Ex. 1005, 32:27–33:45, Figs. 9, 14). Petitioner further contends an ordinary skilled artisan “would have therefore understood that Keagy’s cloud OS (through the HMM) deploys VM instances.” *Id.* at 30 (citing Ex. 1003 ¶¶ 115, 117). Petitioner contends Miller’s “Load Balancer Module (‘LBM’) remotely interacts with the computer network (i.e., the ‘cloud’) to perform various actions, including ‘dynamically add[ing] additional computing nodes’ (i.e., VM instances) to, or ‘removing one or more computing nodes from’ (i.e., ‘termination’), the network, when particular thresholds are met.” *Id.* (citing Ex. 1003 ¶ 116; Ex. 1006, 4:62–5:2, 22:15–18, 22:31–35, 32:41–48).

Petitioner next contends Keagy deploys an instance of a VM “with the cloud OS translating user inputs into a defined VM configuration for the VM instance including the hardware and software resources” and the cloud OS thereafter can “specify . . . thresholds for each of those resources which, when met, not met, or exceeded during VM operation, trigger autonomic upscaling or down-scaling of the VM’s resources (‘autonomic scaling including termination’).” Pet. 30–31 (citing Ex. 1005, 22:43–63, 47:53–59); *see also id.* at 20 (“Users can ‘flag’ VMs for autonomic scaling [in Keagy] by adding resource thresholds to their specifications.” (citing Ex. 1003 ¶ 94; Ex. 1005 47:44–59)). According to Petitioner, an ordinary skilled artisan “would have understood that both Keagy and Miller’s ‘autonomic scaling’ processes ‘includ[e] termination.’” *Id.* at 31. Petitioner contends “Keagy

discloses removing any or all resources associated with a VM as part of the scaling process” and “Miller contemplates an autonomic scaling process that includes ‘removing . . . a computing node [i.e., VM].’” *Id.* at 31–32 (citing Ex. 1003 ¶ 118; Ex. 1005, 28:38–42, 33:46–61, 51:1–52, Fig. 28; Ex. 1006 Abstract, 1:64–2:6, 4:7–26, 22:19–35).

Petitioner next contends “Keagy teaches that the HMM redistributes operations . . . previously executed by existing resources so that they are executed by newly-added resources.” *Id.* at 32–33 (citing Ex. 1003 ¶ 119; Ex. 1005, 36:20–33, 48:44–49:9). According to Petitioner, an ordinary skilled artisan “would have been motivated in view of Miller to adapt Keagy’s teaching to execute data processing workloads on newly-created VM instances, as opposed to just newly-added resource instances.” *Id.* at 33 (citing Ex. 1003 ¶¶ 119, 204–205).

Patent Owner contends that Petitioner fails to establish that Keagy or Miller either alone or in combination disclose or render obvious the limitation “flagging the instance of a VM for autonomic scaling including termination.” PO Resp. 17–23.

Patent Owner contends Keagy discloses “two kinds of resource upscaling”, i.e., horizontal upscaling and vertical upscaling. PO Resp. 17. Patent Owner contends that horizontal upscaling “provides additional software resources that run within an existing virtual machine” and vertical upscaling “provides additional hardware resources to an existing virtual machine, such as additional CPU or additional RAM.” *Id.* (citing Ex. 1005, 7:3–8, 48:47–49:23; Ex. 2011 ¶ 60). According to Patent Owner, “neither form of upscaling involves removing resources from or terminating a virtual machine.” *Id.* at 18 (citing Ex. 2011 ¶ 60).

Patent Owner next contends that Keagy’s downscaling involves either “removing a second resource of a virtual machine that redundantly performs a task already performed by a first resource of the virtual machine” or “decreasing an amount of a resource allocated to a virtual machine.” PO Resp. 18 (citing Ex. 1005, 49:32–39; Ex. 2011 ¶¶ 62–63). According to Patent Owner, neither type of downscaling terminates the virtual machine instance because Keagy’s downscaling “[r]econfigure[s] the virtual machine,” implying that the virtual machine is not terminated as a result of downscaling.” *Id.* (citing Ex. 1005, 50:4–8, Fig. 26; Ex. 2011 ¶ 64). Patent Owner further contends that Keagy’s downscaling “is limited to reducing the resources available to an existing virtual machine instance with too many resources” and “does not describe that its resource down-scaling process removes all of the resources associated with a virtual machine instance in response to the user-specified thresholds that Microsoft cites.” *Id.* at 19 (citing Ex. 1005 49:24–26, 50:4–19, Fig. 26; Ex. 2011 ¶ 64); *see also* Tr. 21:19–22 (“Reconfiguring a VM’s resources is not the same thing as terminating the VM, and in any event, Keagy doesn’t actually describe removing all the VM’s resources.”).

Patent Owner next contends that the portions of Keagy Petitioner cites for terminating an instance of a VM either lack termination or are unrelated to Keagy’s user-specified thresholds. PO Resp. 20. According to Patent Owner, Keagy’s disclosure at column 51, lines 1–52 relates to secure deletion of a VM but is not related to user-specified thresholds, the disclosure at column 28, lines 38–45 doesn’t disclose “terminating the virtual machine instance,” and the disclosure at column 33, lines 46–61 is a user-driven process that is not autonomic. *Id.* (citing Ex. 2011 ¶¶ 66–71).

Patent Owner next contends that Petitioner’s reliance on Miller’s disclosure of removing entire virtual machine instances “does not cure *Keagy*’s failure to teach or suggest a *flag* indicating that an instance of a VM is amenable to autonomic termination.” PO Resp. 21 (citing Ex. 2011 ¶ 72). Patent Owner further contends that neither the Petition nor Dr. Jakobsson “allege that it would have been obvious to modify *Keagy*’s purported ‘flag’ to indicate that an instance of a VM is amenable to autonomic termination.” *Id.* (citing Pet. 31–32; Ex. 1002, 174; Ex. 1003 ¶¶ 114–119); *see also id.* at 22 (“the petition does not even allege that *Miller* discloses or renders obvious the ‘flagging the instance of a VM’”), 23–24 (arguing Petitioner did not even allege that *Miller* cures *Keagy*’s deficiencies as to the claimed ‘flag.’”).

Petitioner, in turn, contends that Patent Owner’s contentions are based on Patent Owner’s construction of “termination” which excludes “terminating operation of the VM when resource usage drops below a threshold value” and on attacking *Keagy* and *Miller* in isolation. Pet. Reply 9, 12. According to Petitioner, when the proper construction of termination is applied, “*Keagy* and *Miller* teach this” limitation. *Id.*

Petitioner contends *Keagy* “teaches that resources assigned to a VM can be decreased if the VM is using fewer resources than specified by the threshold value” and that *Keagy* discloses “the ability to scale hardware resources **to virtually unlimited proportions.**” Pet. Reply 10 (citing Pet. 30–31, Ex. 1005, 26:16–18; 47:53–59, 49:54–50:19). Petitioner contends this disclosure “includes scaling one or all of the hardware resources down to zero” which equates to the VM ceasing operation. *Id.* at 10–11 (citing Ex. 1003 ¶ 18).

Petitioner next contends that Miller teaches removing computing nodes which can be VM's. Pet. Reply 11–12. Petitioner further contends that “Miller’s teachings of removing an entire computing node (*i.e.*, VM) when that node is underutilized, combined with Keagy’s teachings of removing resources allocated to an underutilized VM, based on the threshold value specified by Keagy’s flag, . . . teaches a flag that is ‘for autonomic scaling including termination.’” *Id.* at 12 (citing Ex. 1003 ¶¶ 118–119).

In the Sur-reply, Patent Owner contends that Miller’s teaching of removing a VM that is no longer needed fails to address Keagy’s alleged deficiency with respect to flagging. Sur-Reply 15. According to Patent Owner, “[m]odifying *Keagy* to use *Miller*’s purported *process* would not have modified *Keagy*’s *user-specified thresholds* such that they would have purportedly indicated that a VM instance is amenable to autonomic termination.” *Id.* (citing PO Resp. 23; Ex. 2011 ¶¶ 76–77).

For the following reasons, we find that the combination of Keagy and Miller teaches this limitation. As discussed below, Petitioner argues, and Patent Owner does not dispute, that Keagy teaches or suggests “deploying, by the cloud operating system, an instance of a VM” and that one of ordinary skill in the art would have understood that Keagy “includ[es] flagging the instance of a VM for autonomic scaling including . . . executing a data processing workload on the instance of a VM.” Pet. 29–31; *see generally* PO Resp.; Sur-reply.

The parties dispute whether the combination of Keagy and Miller meets the limitation “flagging the instance of a VM for autonomic scaling including termination.” We first address the parties’ respective contentions for motivation to combine Keagy and Miller and reasonable expectation of success because Patent Owner’s contentions also relate to whether the

proposed combination teaches this limitation and then we address whether Petitioner's proposed combination shows that this limitation would have been obvious to an ordinary skilled artisan.

Motivation to Combine/Reasonable Expectation of Success

Petitioner contends "Keagy and Miller are from the same field (cloud computing) and address the same general concept (dynamically scaling virtual resources up or down based on predefined thresholds)" and an ordinary skilled artisan would "have appreciated that Miller's teachings were complementary to Keagy's making them good targets for combination." Pet. 68 (citing Ex. 1003 ¶¶ 203, 208). Petitioner further contends an ordinary skilled artisan would have recognized that Miller's teaching of adding entire VMs "is advantageous to Keagy because different computing activities burden different VM resources, and scaling a single resource at a time within an existing VM" as in Keagy "would not efficiently alleviate bottlenecks of multiple simultaneous burdens." *Id.* at 69 (citing Ex. 1003 ¶¶ 204–206). According to Petitioner, an ordinary skilled artisan would have understood that adding additional VM instances as disclosed in Miller to Keagy "would more efficiently alleviate bottlenecks." *Id.* Petitioner also contends that removal of entire VMs as disclosed in Miller would allow the system to quickly reallocate resources to a new or existing VM and "adapting Keagy's system in view of Miller's teachings would make the system more efficient." *Id.* at 70 (citing Ex. 1003 ¶ 207). Petitioner further contends an ordinary skilled artisan would have had a reasonable expectation of success "implementing Miller's VM-scaling teachings in Keagy." *Id.* (citing Ex. 1003 ¶¶ 203, 208–209).

Patent Owner contends the mere fact that Keagy and Miller are in the same field is not a reason to combine them. PO Resp. 35. Patent Owner

further contends even if the two references provide complementary teachings, that is still not sufficient to establish a reason to combine. *Id.* Patent Owner next contends that Petitioner’s reason to combine based on the assertion that Keagy and Miller teach the same concepts fails because it is “based on adding a feature from a second reference to a first reference already in possession of that feature.” *Id.* at 36. Patent Owner applies this reasoning to Petitioner’s “argument for providing *Keagy* with *Miller*’s purported teachings of adding entire instances of a virtual machine during a scaling process” because according to Patent Owner, Petitioner contends Keagy “already can ‘deploy[], by the cloud operating system, an additional instance of the VM.’” *Id.* at 37 (citing Pet. 37; Ex. 2011 ¶ 105). Patent Owner repeats this argument in opposing Petitioner’s reasons for incorporating Miller’s teachings of removing entire instances of a virtual machine during scaling because, according to Patent Owner, Petitioner contends that Keagy already discloses this feature. *Id.* at 38 (citing Pet. 69–70; Ex. 2011 ¶ 108).

For the following reasons, we determine that Petitioner persuasively shows that an ordinary skilled artisan would have combined Keagy and Miller in the manner proposed, and Patent Owner’s contentions are unavailing.

We look to Dr. White’s testimony in connection with analyzing Patent Owner’s contentions. With respect to deploying additional instances of a VM, Dr. White points to page 37 of the Petition where Petitioner argues that “Keagy contains a similar disclosure [to Miller]” of up-scaling VM resources. Ex. 2011 ¶ 105. Dr. White, however, specifically states his disagreement that Keagy discloses deploying an additional instance of a VM. *Id.* ¶ 106. Patent Owner also disputes that Keagy discloses deploying

an additional instance of a VM. PO Resp. 29. Patent Owner also disputes that Miller discloses deploying an additional instance of a VM. *Id.* at 28. As explained below in connection with limitation 1.C, Patent Owner's argument that Miller does not disclose deploying an additional instance of VM is based on its claim construction that "deploying" requires "creating a new instance of a VM" that we did not adopt for the reasons stated in Section II.C. *Id.* Dr. White's quibbles with Miller in this regard are also based on the same claim construction that we do not adopt. Ex. 2011 ¶ 107 ("Miller does not create any new instances of a VM"). As further explained in our analysis of limitation 1.C, assuming Patent Owner is correct concerning Keagy's lack of disclosure of adding additional instances of a VM, Miller discloses deploying additional instances of a VM under the proper claim construction. Consequently, modifying Keagy with Miller's disclosure of deploying additional instances of a VM does not entail adding a feature to Keagy that it already possesses. Pet. 69; Ex. 1003 ¶¶ 204–206.

Dr. White's testimony with respect to removing entire instances of a VM takes a similar tack. Dr. White points to page 70 of the Petition that "Keagy already discloses the termination and deletion of entire VMs." Ex. 2011 ¶ 108 (citing Pet. 70). Dr. White specifically states his disagreement that Keagy has such a disclosure. *Id.* Petitioner relies on Dr. Jakobsson's testimony at paragraphs 203 and 208. Pet. 70. In paragraph 208, Dr. Jakobsson directs us to his testimony in connection with, *inter alia*, limitation 1.D. In connection with limitation 1.D, Dr. Jakobsson testifies that "Keagy teaches the termination and deletion of entire VMs *outside of the autonomic scaling context.*" Ex. 1003 ¶ 128. Consequently, modifying Keagy with Miller to terminate entire VM instances in the context of

autonomic scaling as proposed by Petitioner does not entail adding a feature to Keagy that it already possesses.

We also note that neither Patent Owner nor Dr. White take issue with Petitioner's and Dr. Jakobsson's actual reasons for the combination. *See generally* PO Resp.; Ex. 2011. The reasons stated by Petitioner that the combination would increase efficiency in "alleviating bottlenecks of multiple simultaneous burdens," "allow a user of Keagy to expand available processing power of the computing environment over and above any pre-set limits imposed by existing VMs," add additional VM instances that "would more efficiently alleviate bottlenecks," and remove entire VMs to allow the system to simultaneously recover all of the resources formerly allocated to those VMs" are reasonable and supported by the testimony of Dr. Jakobsson which we credit. Pet. 69–70; Ex. 1003 ¶¶ 204–207.

Patent Owner does not dispute that one of ordinary skill in the art would have had a reasonable expectation of success in combining the teachings of Keagy and Miller. *See generally* PO Resp. Based on the reasons stated by Petitioner and Dr. Jakobsson, we also find that a skilled artisan would have had a reasonable expectation of success in combining the teachings of Keagy and Miller as proposed by Petitioner. Pet. 70; Ex. 1003 ¶¶ 203, 208–209.

Alleged Obviousness of Limitation 1.A

Patent Owner does not dispute Petitioner's contention (Pet. 29–30) that Keagy discloses deploying new VM instances using the HMM which is part of Keagy's host OS. *See generally* PO Resp.; Sur-reply. We have reviewed the evidence cited by Petitioner and find that Keagy discloses deploying by the cloud OS an instance of a VM. *See* Ex. 1005, 32:27–33:45, Figs. 9, 14. Further, Patent Owner does not dispute Petitioner's

contention (Pet. 31) that an ordinary skilled artisan would have understood that Keagy flags a VM instance for autonomic scaling “by specifying scaling thresholds for resources associated with a VM, Keagy’s cloud OS adds a marker to the configuration information for that particular VM instance indicating whether that VM instance is to be autonomically scaled.” *See generally* PO Resp.; Sur-reply. We have reviewed the evidence cited by Petitioner and find that Keagy discloses flagging the instance of a VM for autonomic scaling. *See* Ex. 1003 ¶¶ 117–118; Ex. 1005, 47:44–59.

The parties’ dispute over this limitation turns on whether the combined teachings of Keagy and Miller disclose that the flagging for autonomic scaling “includ[es] *termination*.” Patent Owner’s criticisms of Keagy’s disclosure in this regard are based on its construction of “termination” as limited to “removing the flagged instance of a VM.” *See* PO Resp. 18 (arguing Keagy’s up-scaling does not “involve removing resources from or terminating a VM”); *id.* (“Keagy does not state that decreasing the amount of a resource allocated to a virtual machine instance terminates the virtual machine”); *id.* (arguing that Keagy’s disclosure of reconfiguring the virtual machine “impl[ies] that the virtual machine is not terminated as a result of down-scaling.”); Sur-reply 14–15 (“if removing all of a VM instance’s resources still leaves an existing and otherwise operable instance . . . then Keagy’s thresholds for adjusting the resources available to an instance cannot indicate that the instance is amenable to autonomic termination.”). Even if Patent Owner’s contention that removal of all resources from a VM is not “termination” of the VM instance is correct or that Keagy does not disclose removing all resources from the VM instances, the criticisms amount to an attack on Keagy in isolation and ignore Petitioner’s reliance on Miller for disclosing removing an instance of a VM.

We make the following findings of fact concerning Miller's disclosure.

Miller discloses that its "DCS Load Balancer module may interact from one or more remote locations with the computer network being provided by the network-accessible service, such as to execute programs on the computing nodes of the provided computer network, to dynamically add additional computing nodes to the provided computer network." Ex. 1006, 4:62–5:2. Miller further discloses "the computing nodes used by the configurable network service to provide computer networks to clients have various forms, such as . . . virtual machines." *Id.* at 25:65–26:1. Miller also discloses "the defined criteria for a group of computing nodes may specify various factors to consider, and various types of actions to take when particular criteria are satisfied" including "removing a computing node" when a lower threshold is reached. *Id.* at 22:19–27.

Patent Owner does not dispute that Miller explicitly discloses removing an instance of a VM. PO Resp. 22–23. Patent Owner first contends that because Petitioner does not allege that Miller "discloses or renders obvious the 'flagging the instance of a VM'" we are precluded from "finding that *Miller* alone meets the limitation 'flagging the instance of a VM for autonomic scaling including termination.'" *Id.* at 22. Patent Owner is correct that Petitioner does not rely on Miller to meet this limitation and, as discussed below, our determination does not rely on Miller alone. Patent Owner then addresses the actual challenge namely Petitioner's proposed combination of Keagy and Miller. *Id.* at 23. Patent Owner contends that "Microsoft did not even allege that *Miller* cures *Keagy*'s deficiencies as to the claimed 'flag.'" *Id.* (citing Pet. 31; Ex. 2011 ¶¶ 76–77).

As discussed above, Patent Owner does not dispute and we find that Keagy flags an instance of a VM for autonomic scaling by specifying scaling thresholds for resources associated with a VM and Keagy's cloud OS adds a marker to the configuration information for that particular VM. But, Patent Owner takes the position that Keagy does not disclose removing all resources associated with a virtual machine. PO Resp. 19; Tr. 21:19–22; Ex. 2011 ¶ 64. Assuming, *arguendo*, that Keagy does not disclose removing all resources from a VM, Keagy explicitly discloses removing some resources from a VM instance. Ex. 1005, 33:41–45. In fact, Patent Owner concedes that Keagy's downscaling process removes some resources from a VM. PO Resp. 19 (arguing Keagy does not describe that its “down-scaling process removes *all of the resources* associated with a virtual machine instance.”) (emphasis added). Miller, however, explicitly discloses removing VMs when a lower resource threshold is met. Ex. 1006, 22:19–27.

Dr. Jakobsson testifies that an ordinary skilled artisan “would have understood that Keagy and Miller's ‘autonomic scaling’ processes ‘include[e] termination,’ and consequently, that the Keagy ‘flag’ . . . to the extent it provides downscaling thresholds for one or more of a VM's resources—would reflect that the VM's autonomic scaling includes termination” and “Miller discloses the removal of entire VM instances as part of autonomic scaling.” Ex. 1003 ¶ 118; *see also id.* ¶ 207 (testifying why an ordinary skilled artisan “would have been motivated to employ Miller's teaching of removing entire VM instances during autonomic scaling in place of or in addition to Keagy's teaching of removing resources from existing VM's”). Dr. White does not address the substance of Dr. Jakobsson's testimony but merely repeats the contention from the Patent

Owner Response that “the petition does not argue that Miller addresses *Keagy*’s lack of a ‘flag’ indicating that the instance of a VM is amenable to autonomic termination.” Ex. 2011 ¶ 77. We give substantial weight to Dr. Jakobsson’s testimony on this point because it is supported by the disclosure of both *Keagy* and Miller.

For all the foregoing reasons, even if we were to accept Patent Owner’s construction of “termination” as requiring removal of an instance of a VM, Petitioner establishes that the modification of *Keagy* with Miller teaches this limitation. As discussed in our analysis of Petitioner’s motivation to combine, we find Petitioner establishes that it would have been obvious to one of ordinary skill in the art to modify *Keagy* by incorporating Miller’s teaching of a lower resource threshold value for removing a VM. Ex. 1003 ¶¶ 118, 297; Pet. Reply 11–12.

[1.B]: monitoring, by the cloud operating system, one or more operating characteristics of the instance of the VM

Petitioner contends *Keagy* “‘monitor[s]’ resource statistics (690) of each VM instance” shown on nodes 620, 625, and 630 in *Keagy*’s Figure 6. Pet. 33–34 (citing Ex. 1005, 13:22–35, 31:44–32:25, Fig. 6). Petitioner contends the monitored “statistics include available CPU processing resources and memory and input/output resource utilization.” *Id.* at 34 (citing Ex. 1003 ¶¶ 120–123; Ex. 1005, 5:63–6:31, 13:22–52, 22:58–63, 30:6–31:6, 47:47–59, 48:1–26, Fig. 13). Petitioner further contends that Miller’s LBM “monitors ‘status information’ for aspects of the VM, including whether thresholds of particular VM resources are met for load balancing purposes.” *Id.* at 34–35 (citing Ex. 1006, 33:9–30, Fig. 5). According to Petitioner, an ordinary skilled artisan “would have understood

that Keagy, Miller, and Keagy in view of Miller teach monitoring ‘one or more operating characteristics.’” *Id.* at 35–36 (citing Ex. 1003 ¶ 123).

Patent Owner does not directly dispute Petitioner’s contentions. *See* PO Resp. 16–34.

We have reviewed the evidence cited by Petitioner and find that Keagy and/or Miller teach this limitation.

[1.C] deploying, by the cloud operating system, an additional instance of the VM if a value of an operating characteristic exceeds a first predetermined threshold value, including executing a portion of the data processing workload on the additional instance of the VM

Petitioner relies on its contentions for limitation [1.A] for “deploying by the cloud operating system an instance of the VM” and for “executing a portion of the data processing workload” on the additional instance of the VM. Pet. 36. Petitioner contends the remaining requirements of “[t]his limitation [are] disclosed by Keagy, Miller, and Keagy in view of Miller, or at least rendered obvious in view of a POSITA’s knowledge.” *Id.* Petitioner contends “Miller discloses relying on ‘factors’ for ‘defined criteria’ . . . in determining whether to scale ‘computing nodes’ . . . with each factor containing ‘one or more [predetermined] thresholds.’” *Id.* at 36–37 (citing Ex. 1003 ¶¶ 124–125; Ex. 1006, 22:15–67, 32:19–48, 36:4–13). Petitioner contends Keagy similarly discloses “up-scal[ing] VM resources . . . if a predetermined resource threshold is exceeded.” *Id.* at 37 (citing Ex. 1005, 12:27–13:35, 14:1–15:20, 23:61–24:20, 25:66–26:28, 29:1–32, 31:44–32:25, 34:57–35:38, Figs. 6, 7, 12, 13, 16, 26). Petitioner further contends an ordinary skilled artisan would have recognized “Keagy’s resource scaling system would have been greatly improved by using Miller’s VM scaling teachings, which allow for adding or removing entire VM instances as part of autonomic scaling.” *Id.* at 38. According to Petitioner, an ordinary

skilled artisan “would have found it obvious that Keagy’s system could deploy additional VMs when resource values exceed defined thresholds, as taught in Miller, and would not be limited to assigning . . . existing resources to alleviate burdens on the system.” *Id.* (citing Ex. 1003 ¶¶ 204–209).

Patent Owner contends Petitioner “failed to show that any of its permutations of *Keagy* and *Miller* renders obvious ‘deploying, by the cloud operating system, an additional instance of the VM.’” PO Resp. 24 (citing Ex. 2011 ¶¶ 78–101).

Patent Owner contends that “the cited teachings of *Miller* are limited to grouping and ungrouping existing computing nodes.” PO Resp. 25 (citing Pet. 36–37; Ex. 1003 ¶¶ 124–125; Ex. 1006, 22:15–67, 25:65–26:2, 32:19–48, 36:4–13; Ex. 2011 ¶ 79). Patent Owner concedes that Miller discloses a virtual machine as an example of a computing node but contends Miller does “not disclose or render obvious creating a new additional instance of a virtual machine.” *Id.* Patent Owner further contends that an ordinary skilled artisan “would have understood *Miller* to refer to adding existing computing nodes to a group, not creating a new additional virtual machine instance” because Miller’s techniques for increasing the quantity of nodes “involve either (1) reintroducing (‘reinstating’) existing computing nodes to the group; or (2) introducing previously unintroduced existing computing nodes to the group.” *Id.* (citing Pet. 36–37; Ex. 1006, 22:15–67, 23:67–24:3, 29:11–17; Ex. 2011 ¶¶ 80–81). The remainder of Patent Owner’s contentions are all based on Patent Owner’s assertion that Miller does not disclose creating new additional instances of a VM. *See id.* at 26 (“the approach described in that portion of Miller involves either (1) introducing an existing computing node . . . or (2) using an existing computing node” (citing Ex. 1006, 4:12–14, 29:11–27)); 27 (“the selected computing nodes

are ‘from a group of available computing nodes’ implies that those computing nodes already exist.” (citing Ex. 1005, 36:13–22, Fig. 4B; Ex. 2011 ¶ 87)); 28 (“*Miller*’s process for modifying the computing-related resources for computing nodes in a group also does not create a new instance of a virtual machine.” (citing Ex. 1006, 22:53–67; Ex. 2011 ¶ 83) and “*Miller*’s description of its provisioning process confirms that *Miller* deals exclusively in existing virtual machines.” (citing Ex. 1006, 4:38–49, 27:39–50, 36:47–57; Ex. 2011 ¶ 88)); Sur-Reply 17–18.

Patent Owner next contends that “*Keagy*’s up-scaling involves either increasing the hardware resources allocated to an existing virtual machine via vertical up-scaling . . . or providing additional software resources within an existing virtual machine via horizontal upscaling” but neither of these processes “involve[] creating a new additional instance of a virtual machine as required by ‘deploying, by the cloud operating system, an additional instance of the VM.’” PO Resp. 29 (citing Ex. 1005, 7:3–8, 12:37–13:35, 23:61–24:20, 25:66–26:28, 31:44–32:25, 34:57–35:38, 47:44–49:23; Ex. 2011 ¶¶ 92–94).

Patent Owner contends that Petitioner’s proposed modification of *Keagy* “would have impermissibly changed *Keagy*’s principle of operation.” PO Resp. 32. Patent Owner asserts that *Keagy* “is designed for adjusting the resources available to an existing virtual machine instance” and, in its migration process “avoids having more than one virtual machine instance operating concurrently on a data processing workload.” *Id.* (citing Ex. 1005, 7:48–52, 18:66–19:10, 23:61–24:20, 26:16–28, 28:52–67, 29:19–32, 47:44–50:19, 52:38–54; Ex. 2011 ¶¶ 97–98). According to Patent Owner, *Keagy* lacks the architecture to manage two virtual machines concurrently executing the same data processing workload and modifying *Keagy* with

Miller “would have changed *Keagy*’s principle of having only one virtual machine executing a particular data processing workload at a time.” *Id.* (citing Ex. 2011 ¶¶ 97–98).

Patent Owner next argues against the proposed combination of *Keagy* and Miller because, according to Patent Owner, neither Miller nor *Keagy* disclose “creating a new additional instance of a VM.” PO Resp. 33 (citing Ex. 2011 ¶¶ 100–101).

Patent Owner also contends that an ordinary skilled artisan “would not have been motivated to incorporate *Miller*’s grouping and regrouping of instances into *Keagy*’s system” because “*Miller*’s approach . . . violates a fundamental tenet of cloud computing expressed in *Keagy*: each user’s data must be isolated from each other user’s data.” PO Resp. 38 (citing Ex. 1005, 51:42–48; Ex. 2011 ¶¶ 22, 109).

Petitioner, in turn, contends Patent Owner relies on an incorrect construction of the claim. Pet. Reply 14. In particular, Petitioner argues that “Patent Owner largely relies on the contention that ‘deploying’ requires ‘creating’ a ‘new instance’ of the VM.” *Id.* Petitioner, relying on the disclosures in *Keagy* and Miller cited in the Petition, reiterates that “[i]n view of Miller’s clear teachings of adding additional nodes to the same group when the group has insufficient resources to handle a workload . . . *Keagy* in view of Miller teaches duplicating a VM at the same node to process a portion of the workload formerly processed by the original VM.” *Id.* at 15 (citing Ex. 1006, 23:59–24:10).

Petitioner further contends Patent Owner’s argument that modifying *Keagy* to deploy an additional instance of a VM would change *Keagy*’s theory of operation “fails to account for *Keagy*’s clear teaching that its system can ‘duplicate a[] . . . virtual machine at a single node.’” Pet. Reply

18 (citing Ex. 1005, 29:23–26). According to Petitioner, this disclosure in Keagy “teaches the same process as . . . the ’612 patent to manage the same workload with multiple VMs.” *Id.* (citing Ex. 1001, 10:12–17). Petitioner further contends Patent Owner’s argument “relies on an irrelevant migration embodiment.” *Id.* (citing PO Resp. 32; Ex. 2011 ¶¶ 97–98).

Petitioner asserts that Patent Owner’s contention that incorporating Miller’s teachings into Keagy would violate a fundamental tenet of cloud computing “is simply false.” Pet. Reply 18. Petitioner contends that only some embodiments of Keagy provide automated secure deletion of data while “[o]ther embodiments permit ‘reallocating the resources to a different virtual machine.’” *Id.* at 19 (citing Ex. 1005, 51:3–7). According to Petitioner, because Keagy’s secure deletion is just in one embodiment, such procedures are “not a ‘fundamental tenet of cloud computing.’” *Id.*

Patent Owner counters that Petitioner’s “contentions that *Keagy*’s secure deletion process is only one embodiment and that other embodiments involve reallocating *resources* do not address the concerns that ordinarily skilled artisans would have had about reallocating *instances*.” Sur-reply 11–12 (citing PO Resp. 4–5, 38–39; Ex. 2011 ¶¶ 22–24, 109–110). Patent Owner further contends “the fundamental tenet of cloud computing that each user’s data should be isolated from each other user’s data is reflected not only in *Keagy*’s secure deletion process, but also in the general perspective of ordinarily skilled artisans.” *Id.* at 12 (citing Ex. 2011 ¶¶ 22–24).

For the following reasons, we find that Petitioner establishes that Keagy in view of Miller teaches this limitation.

Most of Patent Owner’s contentions are based on its proposed construction of “deploying . . . an additional instance of a VM” which requires “creating . . . a new additional instance of a VM” prior to deploying

it. PO Resp. 8. As discussed above, we do not adopt that construction. Consequently, to the extent Patent Owner's contentions are based on its proposed construction, those contentions are unavailing at the outset.

As discussed above in connection with limitation [1.A], we find Miller discloses “dynamically add[ing] additional computing nodes to the provided computer network.” Ex. 1006, 4:62–5:2. Further, we find Miller discloses that when “a particular group computing node does not have sufficient available capacity to handle new requests, such as due to processor memory . . . being above a maximum threshold . . . one or more computing nodes are added to the group.” *Id.* at 23:60–24:1. Consequently, even if we were to agree with Patent Owner that Keagy is limited to upscaling existing resources of a VM and does not disclose deploying an additional VM instance, Miller discloses deploying an additional instance of a VM if a value of an operating characteristic exceeds a first predetermined threshold.

We now turn to Patent Owner's contention that combining Keagy and Miller would have impermissibly changed Keagy's principle of operation. In support of this contention, Patent Owner relies on Dr. White's testimony that during Keagy's migration process, “*Keagy* does not describe that the original (pre-migration) VM and the copied (migrated VM) work on the same data processing workload concurrently.” Ex. 2011 ¶ 98. Dr. White points to disclosure in Keagy such as “multiple copies of a single virtual machine . . . can [] be deployed at another node within the grid of hardware nodes to meet increased demand.” Ex. 1005, 28:53–63. This portion of Keagy and the other portions cited by Dr. White, however, are silent on whether or not VM's deployed at another node work on the same data processing workload concurrently. Ex. 2011 ¶ 98 (citing Ex. 1005, 7:48–52, 28:52–67, 29:19–32, 52:38–54). Thus, Dr. White's testimony and the cited

portions of Keagy fail to provide credible support for Patent Owner’s assertion that “Keagy avoids having more than one virtual machine instance operating concurrently on a data processing workload.” PO Resp. 32. To the extent that Patent Owner and Dr. White infer that because the new VM is deployed at a different node, the VMs are not operating on the same data processing workload concurrently, such an inference is undercut by Keagy’s disclosure that “a copy provisioning message may be issued to duplicate an already configured . . . virtual machine at a single node or across one or more different nodes.” Ex. 1005, 29:23–26. For these reasons, we do not agree that Keagy’s principle of operation would have been impermissibly changed by Petitioner’s proposed modification of Keagy with Miller.

Patent Owner’s contention that combining Keagy with Miller would violate a fundamental tenet of cloud computing is also unavailing. In support of this contention, Patent Owner relies on Dr. White’s testimony at paragraphs 22 and 109 as well as Keagy’s disclosure at column 51, lines 42–48. PO Resp. 39. Paragraph 22 of Dr. White’s testimony does not discuss keeping user’s data separate in a cloud computing environment or mention this purported “fundamental tenet of cloud computing.” Ex. 2011 ¶ 22. Paragraph 109 of Dr. White’s testimony provides that “[p]reventing accidental data sharing across virtual platforms **is so important to Keagy** that it discusses a secure deletion process to prevent accidental sharing of data between users.” *Id.* ¶ 109 (bolding added).⁷ Although Dr. White

⁷ Patent Owner’s Sur-reply also refers to paragraph 23 of Dr. White’s testimony. Sur-reply 11–12. In paragraph 23, Dr. White discusses separating users’ data but provides no evidence to support Petitioner’s assertion that this is a “fundamental tenet of cloud computing.” Ex. 2011 ¶ 23.

characterizes preventing accidental data sharing as “important to Keagy,” he does not characterize Keagy’s disclosure as reflecting a “fundamental tenet of cloud computing” or even use that phrase. *See id.* Patent Owner also relies on Dr. White’s testimony that “*Miller* is operating in an environment where data sharing between users is not of grave concern.” PO Resp. 39 (citing Ex. 2011 ¶ 110). Dr. White provides no citation to Miller or other explanation to support this assertion. *See* Ex. 2011 ¶ 110. However, if Miller is not concerned with preventing data sharing between users, that fact undercuts Patent Owner’s contention that Keagy’s disclosure reflects a “fundamental tenet of cloud computing” because Miller’s application was filed after the Keagy application. Ex. 1006, code (22); Ex. 1005 codes (22), (60). Because Dr. White’s testimony is unsupported by corroborating evidence, it does not credibly support Patent Owner’s contention that preventing data sharing is a “fundamental tenet of cloud computing” or that Miller is not concerned with preventing data sharing. Consequently, we find this contention to be unavailing.

For the foregoing reasons and after reviewing the evidence cited by Petitioner, we find that Keagy in view of Miller teaches this limitation.

[1.D] terminating operation of the additional instance of the VM if a value of an operating characteristic declines below a second predetermined threshold value;

Petitioner contends “Miller discloses terminating operation of an additional VM instance when the particular operating characteristic declines below a predetermined threshold value.” Pet. 39 (citing Ex. 1006, 22:19–67, 32:19–48, 36:23–38). Petitioner further contends “Keagy discloses removing . . . VM resources when the value of an operating characteristic declines below a predetermined threshold value.” *Id.* (citing Ex. 1003

¶¶ 127–128; Ex. 1005, 12:54–13:35, 23:61–24:20, 25:66–26:28, 29:19–32, 31:44–32:25, 48:27–43, 49:24–50:19, Fig. 26). According to Petitioner, to the extent Keagy does not disclose terminating entire VM instances, an ordinary skilled artisan would have found it obvious to modify Keagy with Miller for the same reasons discussed above in connection with limitation 1.C. *Id.* at 40.

Patent Owner does not directly dispute Petitioner’s contentions. *See* PO Resp. 16–34.

We have reviewed the evidence cited by Petitioner and find that Keagy in view of Miller this limitation.

[1.E] wherein the cloud operating system comprises a module of automated computing machinery, further comprising a self service portal and a deployment engine, and deploying an instance of a VM further comprises:

Petitioner relies on its showing for limitation 1.A for “deploying an instance of a VM” and contends the remainder of this limitation “is disclosed by Keagy, Miller, and Keagy in view of Miller, or at least rendered obvious in view of a POSITA’s knowledge.” Pet. 40. Petitioner contends “Keagy’s cloud OS . . . necessarily ‘comprises a module of automated computing machinery,’ because the ’612 Patent defines such ‘module[s]’ as including ‘operating system[s].’” *Id.* at 41 (citing Ex. 1001, 7:23–31). Petitioner further contends Keagy’s “service request server” corresponds to the recited “self-service portal” because it “provides a graphical user interface . . . through which users can specify VM configurations, and a ‘front end provisioning manager,’ which processes configurations received from the GUI.” *Id.* (citing Ex. 1005, 14:1–15:6, 17:51–19:24, 31:63–33:61, 34:4–56, 44:35–50:67, Figs. 7, 9, 14). Petitioner contends that “Miller similarly discloses a self-service portal in the form of a GUI through which

users may configure VMs.” *Id.* (citing Ex. 1003 ¶¶ 129–130; Ex. 1006, 4:62–5:2, 6:56–59, 24:53–25:11, 29:25–51). Petitioner further contends Keagy’s “cloud OS includes an HMM (i.e., ‘deployment engine’) that receives VM configurations from the self-service portal and identifies nodes upon which the hypervisor can implement them.” *Id.* (citing Ex. 1005, 32:39–63). Petitioner contends that Miller’s LBM “receives VM configurations from the self-service portal and uses them to create VM’s with those configurations.” *Id.* at 42 (citing Ex. 1003 ¶ 132; Ex. 1006, 2:53–25:17, 29:25–51).

Patent Owner does not directly dispute Petitioner’s contentions. *See* PO Resp. 16–34.

We have reviewed the evidence cited by Petitioner and find that Keagy in view of Miller teaches this limitation.

[1.F] passing by the self service portal user specifications for the instance of a VM to the deployment engine;

Petitioner relies on its showing for limitation 1.E that Keagy and Miller disclose the self-service portal and communicate “user specifications for the VM instance to the deployment engine.” Pet. 42.

Patent Owner does not directly dispute Petitioner’s contentions. *See* PO Resp. 16–34.

We have reviewed the evidence cited by Petitioner and find that Keagy in view of Miller teaches this limitation.

[1.G] implementing and passing to the data center administration server, by the deployment engine, a VM template with the user specifications; and

Petitioner contends Keagy “contemplates utilities within the data center administration server . . . that may assist the HMM (‘deployment engine,’ *see supra* 1.E.) in automatically installing, configuring, and deleting

VMs in the server group, including the UMM and proxy managers (‘PMs’).” Pet. 43 (citing Ex. 1005, 12:9–26, 13:9–21). According to Petitioner “[t]he UMM and/or PMs receive messaging from the HMM (‘passing to the data center administration server, by the deployment engine’), such as ‘user specifications’ for a VM instance and communicate with the server’s corresponding hypervisor(s) to execute it.” *Id.* (citing Ex. 1005, 12:14–26, 36:20–34, 36:48–59, 40:30–39). Petitioner further contends Keagy’s descriptions of the various messages “disclose[], or at the very least render[] obvious, the ‘implementing and passing to the data center administration server, by the deployment engine, a VM template with the user specifications.’” *Id.* (citing Ex. 1003 ¶¶ 135–136).

Patent Owner does not directly dispute Petitioner’s contentions. *See* PO Resp. 16–34.

We have reviewed the evidence cited by Petitioner and find that Keagy in view of Miller teaches this limitation.

[1.H] calling, by the data center administration server, a hypervisor on a cloud computer to install the VM template as an instance of a VM on the cloud computer.

Petitioner contends Keagy’s cloud computers contain hypervisors. Pet. 45–46 (citing Ex. 1005, 26:39–27:46, Fig. 9). Petitioner further contends that Keagy’s data center administration server calls the hypervisors to instantiate VM configurations as new VM instances on the cloud computers. *Id.* at 46–47 (citing Ex. 1003 ¶¶ 140–141; Ex. 1005, 14:34–15:6, 42:54–62).

Patent Owner does not directly dispute Petitioner’s contentions. *See* PO Resp. 16–34.

We have reviewed the evidence cited by Petitioner and find that Keagy discloses this limitation.

Summary of Claim 1

For all the foregoing reasons, Petitioner establishes by a preponderance of the evidence that claim 1 is unpatentable over Keagy and Miller.

Independent Claim 6

Claim 6 is directed to an apparatus for autonomic scaling of virtual machines in a cloud computing environment and contains many limitations substantively similar to those in claim 1. Ex. 1001, 16:57–17:29. For the substantively similar limitations, Petitioner relies on its contentions for claim 1. Pet. 63. For the limitations specifically directed to the apparatus, Petitioner provides citations to evidence from Keagy, Miller, and the testimony of Dr. Jakobsson. *See id.* at 61–63.

Patent Owner does not dispute Petitioner's additional contentions concerning claim 6. *See generally* PO Resp.

We have reviewed the evidence cited by Petitioner and find that Keagy in view of Miller teaches the additional limitations. For the same reasons discussed above for claim 1, Petitioner persuades us that Keagy in view of Miller teach the substantive limitations of claim 6 and that one of ordinary skill in the art would have modified Keagy in view of Miller in the manner proposed with a reasonable expectation of success.

Thus, we determine, that Petitioner establishes by a preponderance of the evidence that claim 6 is unpatentable over Keagy and Miller.

Independent Claim 11

Claim 11 is directed to a computer program product for autonomic scaling of virtual machines in a cloud computing environment and contains

many limitations substantively similar to those in claim 1. Ex. 1001, 18:12–50. For the substantively similar limitations, Petitioner relies on its contentions for claim 1. Pet. 67. For the limitations specifically directed to the computer program product, Petitioner provides citations to evidence from Keagy, Miller, and the testimony of Dr. Jakobsson. *See id.* at 65–67. Patent Owner does not dispute Petitioner’s additional contentions concerning claim 11. *See generally* PO Resp.

We have reviewed the evidence cited by Petitioner and find that Keagy in view of Miller and the knowledge of an ordinary skilled artisan teaches the additional limitations.

For the same reasons discussed above for claim 1, Petitioner persuades us that Keagy in view of Miller teach the substantive limitations of claim 11 and that one of ordinary skill in the art would have modified Keagy in view of Miller in the manner proposed with a reasonable expectation of success.

Thus, we determine, that Petitioner establishes by a preponderance of the evidence that claim 11 is unpatentable over Keagy and Miller.

4. Dependent Claims 3, 8, 13

These claims each recite “wherein flagging the instance of a VM for autonomic scaling includes storing, in the cloud operating system in association with an identifier of the instance of a VM, predetermined threshold values of operating characteristics, including threshold values for processor utilization and for memory utilization.” Ex. 1001, 16:25–30, 17:47–52, 19:1–6.

For claim 3, Petitioner relies on its contentions for limitation 1.A for disclosing flagging a VM instance for autonomic scaling by adding a marker to the configuration information for the particular VM instance. Pet. 51. In

connection with claim 3, Dr. Jakobsson testifies that Keagy's flagging as explained for limitation 1A, "constitutes 'storing . . . in association with an identifier of the instance of a VM, predetermined threshold values of operating characteristics.'" Ex. 1003 ¶ 151. Petitioner further relies on its contentions for limitation 1.B for disclosing processor and memory utilization are among the predetermined threshold values. *Id.* Petitioner relying on its contentions for limitations 1.E–1.G that "Keagy discloses that the configuration information for a VM instance . . . is ingested by the self service portal and flows to the HMM." *Id.* According to Petitioner, "[b]ecause the portal and HMM are part of the cloud OS . . . , a [skilled artisan] would have understood that these 'threshold values' are 'stor[ed]' in the cloud OS." *Id.* (citing Ex. 1003 ¶¶ 151–153). Petitioner further contends "Miller includes similar disclosures, with information flowing from the self-service portal to the [Load Balancing Module], which is part of Miller's cloud OS" and that "Miller's 'threshold values' are also 'stor[ed]' in the cloud OS." *Id.* at 51–52.

Patent Owner responds that "[s]toring of thresholds is not disclosed in the cited portions of *Keagy*." PO Resp. 34–35. Patent Owner contends that even if storing thresholds were disclosed in Keagy, Petitioner "failed to prove that storing those thresholds in association with an identifier of a particular VM instance is purportedly disclosed or rendered obvious." *Id.* at 35. Patent Owner further contends Petitioner "failed to point to any indication in *Miller* that there are stored identifiers associated with specific instances." *Id.* Patent Owner also contends that Petitioner's "description of information 'flowing' to a portion of the system does not disclose or suggest 'storing, in the cloud operating system in association with an identifier of the instance of a VM.'" *Id.*

Petitioner, in turn, contends “Keagy clearly teaches that threshold values are stored in association with each VM.” Pet. Reply 20 (citing Pet. 30–31). Petitioner further contends that “Keagy teaches that the cloud OS specifies (based on user input) threshold values for each resource defined for a VM, and these values are used by the UMM of the cloud OS.” *Id.* (citing Ex. 1005, 47:53–55).

In the Sur-reply, Patent Owner contends that the portion of Keagy cited in the Reply “fails to show that *Keagy*’s purported processor and memory thresholds are stored ‘in the cloud operating system.’” Sur-reply 20.

Patent Owner’s contentions revolve around the purported lack of disclosure in Keagy of storing resources thresholds in the cloud OS. Petitioner directs us to its contentions for limitation 1.A which relies on the disclosure in Keagy at column 32, line 27 to column 33, line 45 as well as Figures 9 and 14. Pet. Reply 29. Keagy discloses “[t]he process *stores* (at 1460) the allocation of resources for the virtual machine configuration into a database tracking the allocation of resources for the entire grid The *stored* data permits the hypervisor management module to quickly access information for any virtual machines” and “[s]uch information can be used by the hypervisor management module . . . to identify and then to remove, migrate, modify, stop, or resume one or more components from any configuration operating within the grid of nodes.” Ex. 1005, 33:33–45 (emphasis added). Keagy further discloses that “the user defines each of the hardware resources and software resources for the virtual machines” and also the thresholds for those resources and based on “whether the specified thresholds are met or exceeded during runtime operation of the virtual machines, the utility management module of some embodiments

automatically up-scales or down-scales the various resources of the virtual machine.” *Id.* at 47:55–59. Based on the foregoing, we find that Keagy stores the threshold values in the cloud OS as required by claim 3. *See also* Ex. 1003 ¶¶ 152–153. Further, as explained by Dr. Jakobsson, this process constitutes storing the thresholds in association with an identifier of a VM. *Id.* ¶ 153; *see also* Ex. 1005, Fig. 9 (virtual machines identified with identifiers VM_1–VM_N in each node of grid 965). Dr. White does not dispute this portion of Dr. Jakobsson’s testimony. *See generally* Ex. 2011.

For all the foregoing reasons, we determine that Petitioner establishes by a preponderance of the evidence that claim 3 is unpatentable over Keagy and Miller.

For claims 8 and 13, Petitioner relies on its contention for claim 3. Pet. 63–64, 67. Patent Owner relies on the same contentions as for claim 3. PO Resp. 34. For the same reasons as discussed for claim 3, we determine that Petitioner establishes by a preponderance of the evidence that claims 8 and 13 are unpatentable.

5. *Dependent Claims 2, 7, 12*

Claim 2 depends from claim 1 and recites:

[2.PRE] the cloud operating system comprises a module of automated computing machinery, further comprising a self service portal and a deployment engine;

[2.A] the method further comprises receiving, through a user interface exposed by the self service portal, user specifications of the VM, the user specifications including specifications of computer processors, random access memory, hard disk storage, input/output resources, application programs, and a specification for autonomic scaling that includes predetermined threshold values for operating characteristics; and

[2.B] deploying an instance of a VM further comprises deploying the instance of a VM in the cloud computing environment

in accordance with the received user specifications.
Ex. 1001, 16:9–24.⁸

Petitioner contends that, to the extent the preamble of claim 2 is limiting, it is disclosed by Keagy, Miller, and the knowledge of an ordinary skilled artisan. Pet. 47. Petitioner directs us to its contentions for limitation 1.E. *Id.* (citing Ex. 1003 ¶ 143).

Patent Owner does not address Petitioner’s contentions or whether the preamble is limiting. *See generally* PO Resp.

We have reviewed the evidence cited by Petitioner for limitation 1.E and find that Keagy and Miller teach the subject matter of the preamble of claim 2 regardless of whether the preamble is limiting.

For limitation 2.A, Petitioner directs us to its contentions for limitations 1.E–1.F for disclosing “receiving, through a user interface exposed by the self service portal user specifications of the VM” and its contentions for limitations 1.B–1.D for disclosing “‘predetermined threshold values for operating characteristics’ that are part of the VM ‘specification’ and are used ‘for autonomic scaling.’” Pet. 47–48. For the remainder of limitation 2.A, Petitioner contends “Keagy discloses various resources that the user may assign to the VM during configuration (i.e., in creating VM’s ‘user specifications’),[□] including but not limited to . . . computer processors, memory, disk storage, input/output resources and application programs.” *Id.* at 48 (citing Ex. 1003 ¶ 145; Ex. 1005, 13:22–35, 15:7–20, 32:39–33:19, 43:33–37, 44:56–46:58, 47:50–59, Fig. 14). Petitioner further contends Miller “discloses resources whose specifications may be included in a VM’s

⁸ Claims 7 and 12 contain substantially similar limitations. *See* Ex. 1001, 17:30–46, 18:51–57. Petitioner relies on its contentions for claim 2 for claims 7 and 12. Pet. 63, 67.

user specifications,[¶] including processors, memory, logical storage volume (‘hard disk storage’), I/O bandwidth (‘input/output resources’), and application programs.” *Id.* at 49 (citing Ex. 1003 ¶ 146; Ex 1006, 3:23–61, 22:19–47).

Patent Owner does not address Petitioner’s contentions. *See generally* PO Resp.

We have reviewed the evidence cited by Petitioner and find that Keagy and Miller teach this limitation.

For limitation 2.B, Petitioner directs us its contentions for limitations 1.A and 1.E–1.H for disclosing “deploying the instance of a VM . . . in accordance with . . . the received [from the self-service portal] user specifications.” Pet. 50. For the remainder of the limitations, Petitioner contends “Keagy and Miller both disclose the ‘cloud computing environment’ comprises ‘VM’s’ that ‘are installed upon cloud computers.’” *Id.* Petitioner further contends that an ordinary skilled artisan “would have understood that a ‘cloud computing environment’ could not comprise ‘VM’s’ . . . unless those ‘VM’s’ had been ‘deploy[ed]’ in that ‘cloud computing environment’ in accordance with defined ‘specifications,’ as recited in limitation 2.B.” *Id.* (citing Ex. 1003 ¶¶ 147–148). According to Petitioner, this means deploying the instance of a VM in the cloud computing environment would have been obvious to an ordinary skilled artisan. *Id.*

Patent Owner does not address Petitioner’s contentions. *See generally* PO Resp.

We have reviewed the evidence cited by Petitioner and find that Keagy and Miller teach this limitation.

For all the foregoing reasons, we determine that Petitioner establishes by a preponderance of the evidence that claims 2, 7, and 12 would have been unpatentable.

6. *Dependent Claims 4, 9, 14*

Claim 4 depends from claim 1 and recites:

[4.PRE] wherein the cloud operating system comprises a module of automated computing machinery, further comprising a self service portal and a deployment engine, and deploying an additional instance of the VM further comprises:

[4.A] passing by the self service portal user specifications for the additional instance of the VM to the deployment engine;

[4.B] implementing and passing to the data center administration server, by the deployment engine with the user specifications, a same VM template used to deploy a previous instance of the VM; and

[4.C] calling, by the data center administration server, a hypervisor on a cloud computer to install the same VM template as a additional instance of the VM on a cloud computer.

Ex. 1001, 16:31–45.⁹

Petitioner contends that to the extent the preamble of claim 4 is limiting “it is identical to limitation 1.E but for the deployment of an ‘additional’ VM instance.” Pet. 52. Petitioner contends that Keagy, Miller, and the knowledge of an ordinary skilled artisan render this obvious because an ordinary skilled artisan would have appreciated the advantages of deploying more than one VM instance as opposed to merely increasing the resources of a single VM. *Id.* at 52–53 (citing Ex. 1003 ¶¶ 156–157).

Patent Owner does not address Petitioner’s contentions or whether the preamble is limiting. *See generally* PO Resp.

⁹ Claims 9 and 14 contain substantially similar limitations. *See* Ex. 1001, 17:53–67, 19:7–21. Petitioner relies on its contentions for claim 4 for claims 9 and 14. Pet. 64, 68.

We have reviewed the evidence cited by Petitioner for limitation 1.E and find that Keagy and Miller teach the subject matter of the preamble of claim 4 regardless of whether the preamble is limiting.

For limitation 4.A, Petitioner relies on its contentions for limitation 1.F. Pet. 53. Because limitation 4.A refers to an “additional” VM instance, Petitioner makes similar arguments as for the preamble of claim 4. *Id.* (citing Ex. 1003 ¶¶ 158–159)

Patent Owner does not address Petitioner’s contentions. *See generally* PO Resp.

We have reviewed the evidence cited by Petitioner and find that Keagy and Miller teach this limitation.

For limitation 4.B, Petitioner relies on its contentions for limitations 1.F, 1.G, and 1.H. Pet. 53–54. Petitioner contends that Keagy, Miller, and the knowledge of an ordinary skilled artisan teach the remaining element of this limitation that is “‘passing . . . [that] same,’ previously used ‘VM template’ to the ‘deployment engine.’” *Id.* at 54. Petitioner further contends “‘Keagy discloses using . . . ‘the same VM template’ that has already been ‘used to deploy a previous’ VM instance, and indeed, this was a concept well-known in the art.” *Id.* (citing Ex. 1005, 22:43–63, 29:23–26, 32:27–35, 39:17–25). According to Petitioner, an ordinary skilled artisan would have been motivated to deploy additional VM instances for the reasons discussed in connection with the preamble of claim 4. *Id.* (citing Ex. 1003 ¶¶ 160–162).

Patent Owner does not address Petitioner’s contentions. *See generally* PO Resp.

We have reviewed the evidence cited by Petitioner and find that Keagy, Miller, and the knowledge of an ordinary skilled artisan teach this limitation.

For limitation 4.C, Petitioner relies on its contentions for limitation 1.H. Pet. 55. For the requirement that the template “must be the ‘same’ VM template previously used, and must here be deployed as an ‘additional’ instance,” Petitioner contends Keagy discloses or renders obvious the limitation. *Id.* Petitioner also relies on its contentions for the preamble of claim 4 and limitation 4.B. *Id.* at 56.

Patent Owner does not address Petitioner’s contentions. *See generally* PO Resp.

We have reviewed the evidence cited by Petitioner and find that Keagy and Miller teach this limitation.

For all the foregoing reasons, we determine that Petitioner establishes by a preponderance of the evidence that claims 4, 9, and 14 would have been unpatentable.

7. Dependent Claims 5, 10, 15

Claim 5 depends from claim 1 and recites:

[5.PRE] wherein the cloud operating system comprises a module of automated computing machinery, further comprising a self service portal, and terminating operation of the additional instance of the VM further comprises:

[5.A] transmitting, by the self service portal to the data center administration server, an instruction to terminate the additional instance of the VM; and

[5.A] calling, by the data center administration server, a hypervisor on a cloud computer to terminate operation of the additional instance of the VM on the cloud computer.

Ex. 1001, 16:46–56.¹⁰

For the preamble of claim 5, Petitioner relies on its contentions for limitations 1.A, 1.D, and 1.E. Pet. 56.

Patent Owner does not address Petitioner’s contentions or whether the preamble is limiting. *See generally* PO Resp.

We have reviewed the evidence cited by Petitioner for limitations 1.A, 1.D, and 1.E and find that Keagy, Miller, and the knowledge of an ordinary skilled artisan teach the subject matter of the preamble of claim 5 regardless of whether the preamble is limiting.

For limitation 5.A, Petitioner relies on its contentions for limitations 1.F–1.H except for “transmission of a ‘terminat[ion]’ instruction . . . from the portal to the server.” Pet. 57. Petitioner contends that Keagy discloses transmitting an instruction to terminate an additional VM instance. *Id.* at 57 (citing Ex. 1003 ¶¶ 169–170; Ex. 1005, 33:46–61, Fig. 14).

Patent Owner does not address Petitioner’s contentions. *See generally* PO Resp.

We have reviewed the evidence cited by Petitioner and find that Keagy and Miller teach this limitation.

For limitation 5.B, Petitioner relies on its contentions for limitations 1.H and 5.A. Pet. 60.

Patent Owner does not address Petitioner’s contentions. *See generally* PO Resp.

We have reviewed the evidence cited by Petitioner and find that Keagy and Miller teach this limitation.

¹⁰ Claims 10 and 15 contain substantially similar limitations. *See* Ex. 1001, 18:1–11, 19:22–32. Petitioner relies on its contentions for claim 5 for claims 10 and 15. Pet. 64, 68.

For all the foregoing reasons, we determine that Petitioner establishes by a preponderance of the evidence that claims 5, 10, and 15 would have been unpatentable.

E. Patent Owner's Request to De-institute This Proceeding

Patent Owner contends that Petitioner's lone ground in this case, based on Keagy, Miller, and the knowledge of an ordinary skilled artisan, fails to meet the particularity requirement of 35 U.S.C. § 312(a)(3). PO Resp. 42. According to Patent Owner, this simple ground purportedly yields "a staggering 393,216 distinct permutations" for claim 1, "2,097,152 distinct permutations" for claim 6, and "1,572,864 distinct permutations for Claim 11." *Id.* at 47–48. Based on its mathematical permutations, Patent Owner requests that we de-institute this proceeding. *Id.* at 51. In support of this request, Patent Owner cites a series of Board decisions where, unlike here, petitions were not instituted due to failure to comply with the 35 U.S.C. § 312(a)(3). *Id.* at 49–51 (citing *Paypal, Inc. v. IOEngine*, IPR2019-00907, Paper 16 (PTAB, Oct. 29, 2019); *Adaptics, Ltd. v. Perfect Co.*, IPR2018-01596, Paper 20 (PTAB Mar. 6, 2019) (informative); *Infera Corp. v. Core Optical Techs., LLC*, IPR2018-01259, Paper 9 (PTAB Jan 14, 2019); *Mastercard Int'l, Inc. v. Grecia*, IPR2017-00793, Paper 7 (PTAB July 3, 2017)).

Petitioner responds that Patent Owner never raised this issue in the Patent Owner Preliminary Response which is the appropriate place to raise institution challenges. Pet. Reply 20 (citing 37 C.F.R. § 42.107(a)).

For the following reasons, we determine not to de-institute this proceeding.

The Petition was filed on May 7, 2021. Paper 1. Patent Owner filed its Preliminary Response on August 23, 2021. Paper 6. Patent Owner failed

to raise the issue of whether the Petition complied with the particularity requirement in the Patent Owner Preliminary Response. *See generally* Paper 6. Our Decision on Institution was entered on November 8, 2021. Paper 13. Patent Owner’s request to de-institute is a request to reconsider our Decision on Institution and should have been raised by means of a motion for rehearing. Our rules provide that any motion for rehearing of a decision on institution must be filed within 14 days of the entry of the decision. 37 C.F.R. § 42.71(d)(1). Because Patent Owner failed to raise this issue in either the Preliminary Response or by way of a timely motion for rehearing of our Decision on Institution, we deny the request to de-institute as untimely.¹¹

¹¹ Even if we were to consider the permutation of grounds argued by Patent Owner, we disagree with Patent Owner (PO Resp. 52) that *BioDelivery Scis. Int’l, Inc. v. Aquestive Therapeutics, Inc.*, 935 F.3d 1362 (Fed. Cir. 2019) requires us to address every such ground in a Final Written Decision. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding that a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”); *Bos. Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App’x 984, 990 (Fed. Cir. 2020) (non-precedential) (recognizing that the “Board need not address issues that are not necessary to the resolution of the proceeding” and, thus, agreeing that the Board has “discretion to decline to decide additional instituted grounds once the petitioner has prevailed on all its challenged claims”).

III. CONCLUSION¹²

Weighing the evidence and the competing testimony, we determine that Petitioner establishes by a preponderance that claims 1–15 of the '612 patent are unpatentable.

In summary:

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–15	103	Keagy, Miller, and the knowledge of an ordinary skilled artisan	1–15	

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–15 of the '612 patent have been shown to be unpatentable; and

FURTHER ORDERED that any party seeking judicial review must comply with the notice and service requirements of 37 C.F.R. § 90.2.

¹² Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

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