

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC,
Petitioner,

v.

VALTRUS INNOVATIONS LIMITED,
Patent Owner.

IPR2022-01406
Patent 7,748,005 B2

Before NORMAN H. BEAMER, SHARON FENICK,
and PAUL J. KORNICZKY, *Administrative Patent Judges*.

BEAMER, *Administrative Patent Judge*.

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

I. INTRODUCTION

On August 17, 2022, Google LLC (“Petitioner”) filed a Petition (“Pet.”) pursuant to 35 U.S.C. §§ 311–319 to institute an *inter partes* review of claims 1–20 of U.S. Patent No. 7,748,005 B2 (Ex. 1001, “the ’005 patent”). Paper 2. On January 12, 2023, Valtrus Innovations Limited (“Patent Owner”) filed a Preliminary Response (“Prelim. Resp.”). Paper 9. As authorized by the Board, Petitioner filed a Reply and Patent Owner filed a Sur-Reply, directed to “Patent Owner’s [alleged] failure to tell the Board about record evidence contravening Patent Owner’s ‘virtual machine’ arguments”; “Patent Owner’s arguments regarding 37 C.F.R. 42.104(b)”; and “Patent Owner’s discretionary denial arguments under 35 U.S.C. §§ 314(a) and 325(d).” Ex. 1054; Papers 11, 12.

The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted unless the information presented in the Petition and any preliminary response shows that “there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.”

For the reasons explained below, we determine that Petitioner has established a reasonable likelihood that it would prevail with respect to at least one challenged claim. Accordingly, we institute an *inter partes* review as to the challenged claims and grounds raised in the Petition.

II. BACKGROUND

A. The ’005 Patent

The ’005 patent, titled “System And Method For Allocating A Plurality Of Resources Between A Plurality Of Computing Domains,” was

filed on September 10, 2004, issued on June 19, 2010, and is a continuation-in-part of application No. 10/206,594, filed on July 26, 2002, published February 20, 2003 as publication 10/206,594 (hereafter, the “McCarthy application” or “McCarthy”), now U.S. Patent No. 7,140,020, which is a continuation-in-part of application No. 09/493,753, filed on January 28, 2000, now U.S. Patent No. 7,228,546. Ex. 1001, codes (54), (22), (45), (63); Ex. 1005; Ex. 1006; Ex. 1013, codes (21), (43).

The ’005 patent is directed to allocating resources to computing domains. Ex. 1001, 1:19–21. The ’005 patent specifically describes two types of resource allocations to computer domains: “allocating physical resources between partitions,” and allocating “virtual resources as software constructs” to “virtual machines.” *Id.* at 13:37–47. Resource allocation is performed dynamically by the system, in response to changes in workload characteristics in the system, based on performance goals with different priorities defined by an administrator. *Id.* at 3:6–7, 3:14–20, 4:36–40.

For physical partitions, the ’005 patent explains that computer systems, which can be “a single small computer . . . a single large computer . . . or a network of larger and/or small computers,” can be divided into “protection domains or partitions.” Ex. 1001, 3:7–14. “Each partition may have one or more processors and other systems resources, e.g. storage devices, I/O devices, etc.” *Id.* at 4:61–63. “Each partition is preferably running its own operating system . . . which provides segregation and survivability between the partitions.” *Id.* at 4:63–66.

For virtual machines, the ’005 patent explains that:

[V]irtualization refers to the creation of virtual machines that coexist on one or several physical servers. Virtualization software typically executes in connection with a host operating

system of the physical server. The virtualization software creates virtual resources as software constructs. The virtual resources are then assigned to virtual machines used for respective servers. Specifically, the virtual resources are used to execute “guest” operating systems that execute on top of the host operating system. The guest operating systems are then used to execute applications. Furthermore, each guest operating system operates independently. A software fault associated with any particular guest operating system and its application(s) may be contained within a given virtual machine.

Ex. 1001, 13:42–55; *see also id.* at 1:37–48.

Figure 1, reproduced below, illustrates a physical partition embodiment of the '005 patent subject matter.

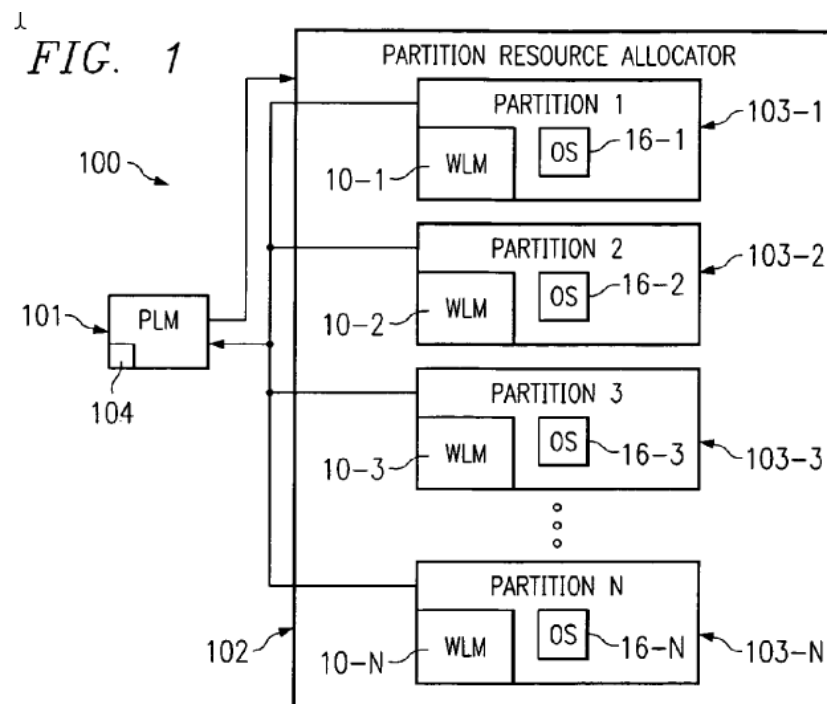


Figure 1 depicts partition load manager (PLM) 101 operating with a plurality of partitions 103-1 through 103-N, with each partition including workload manager (WLM) 10 and operating system (OS) 16. Ex. 1001, 2:52–54, 4:59–66. Although not shown in Figure 1, each partition also includes, *inter*

alia, CPUs (processors), applications, a performance monitor, and a goals configuration file containing application goals and priorities. *Id.* at Fig. 2, 6:6–12, 6:30–38. PLM 101 receives resource requests from the partitions, compares the requests with available resources, and allocates resources based on performance goals and priorities, either within a partition among applications, or between partitions. *Id.* at 3:25–31, 3:38–44, 4:21–29, 5:14–16. Although Figure 1 depicts the PLM as separate from the partitions, it may reside in one partition and have access to the other partitions, or reside in each partition, and cooperatively allocate resources amongst themselves. *Id.* at 4:14–19.

Each WLM receives goal and priority information from the goals configuration file (provided by a user or administrator), and receives performance information from the performance monitor, which monitors the performance of the applications and devices within the partition. Ex. 1001, 3:58–59, 6:30–38. The WLM maintains a list of prioritized application goals with an indication of the quantity of each required resource. *Id.* at 4:24–27. The WLM compares the monitored information with the goals and priorities, and based on the comparison sends resource requests to the PLM. *Id.* at 3:65–4:9, 5:23–25, 6:30–38. The PLM receives the requests, and allocates the resources between the different partitions, based on the priorities of the partitions and the resource requests. *Id.* at 4:21–23, 7:13–17. WLM, after receiving information from PLM about its partition resources, then allocates its allotted resources among the applications on its partition. *Id.* at 4:11–13.

Figure 7, reproduced below, illustrates a virtual machine embodiment of the '005 patent subject matter.

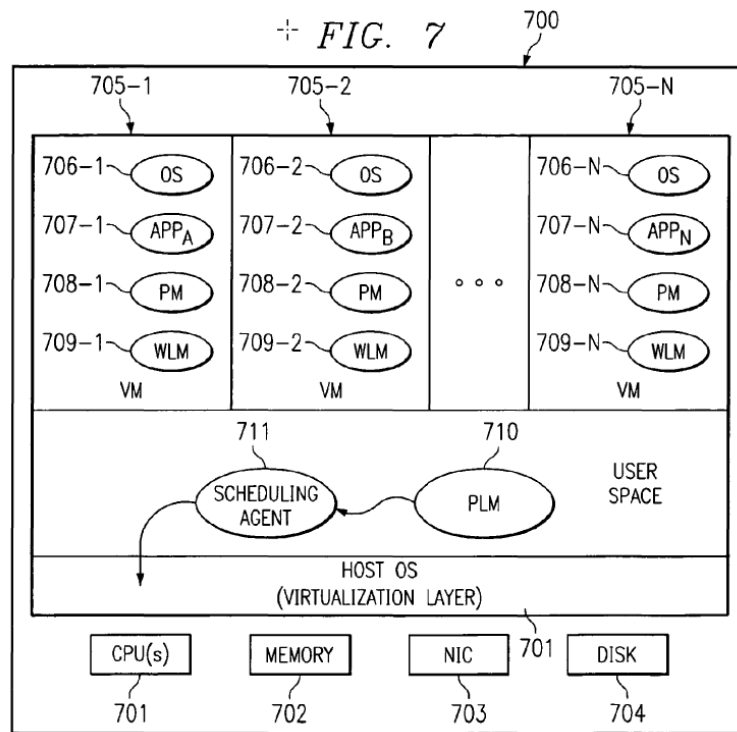


Figure 7 depicts a system that allocates virtual resources, based on underlying physical resources including CPUs 701, memory 702, network interface card (NIC) 703, and disk storage 704, and a host operating system that enables low level access to the physical resources. Ex. 1001, 13:62–67. The host operating system includes a virtualization software layer that virtualizes the physical resources as software constructs, creating virtual machines 705-1 through 705-N. *Id.* at 13:45–48, 13:65–14:5. The virtual machines “appear to software processes executing within the virtual machines to be physical server platforms,” and “provide partition and isolation functionality” such that a “software fault within any particular virtual machine 705 may only affect the respective virtual machine 705, while software processes associated with the other virtual machines 705 may continue operations in an ordinary manner.” *Id.* at 14:5–13.

Each virtual machine includes guest operating system (OS) 706, applications (APP) 707, performance monitors (PM) 708, and workload manager (WLM) 709. Ex. 1001, 14:13–23. Partition load manager (PLM) 710 and scheduling agent 711 are software processes that operate in the user space associated with the host operating system. *Id.* at 14:27–37. The functional interaction between WLMs and PLM is essentially the same as that described above for the physical partition embodiment: WLM receives performance data related to applications from the performance monitor and compares that to goals and priorities (also referred to as “SLOs,” or service level objectives), and when an application is not achieving its goals, WLM requests additional resources from PLM, which reallocates resources as appropriate. *Id.* at 14:21–34. PLM communicates with scheduling agent 711 which, for example, reassigns time slices of processors between virtual machines. *Id.* at 14:37–40.

B. Illustrative Claim

Independent claim 8 is reproduced below (with Petitioner’s identifiers of limitations in brackets).

8. A method, comprising:
 - [8.a] creating a plurality of computing domains;
 - [8.b] allocating a plurality of resources between said plurality of computing domains by a first manager process;
 - [8.c] executing at least one application, a second manager process, and a performance monitor process in each of said plurality of computing domains,

[8.d] wherein said second manager process maintains a list comprising a plurality of application priority levels for said at least one application and an indication of a quantity of said plurality of resources needed to meet said at least one level of said application priority levels and

[8.e] wherein said performance monitor process generates performance data related to said at least one application and

[8.f] said second manager process requests additional resources from the first manager process in response to analysis of said performance data in view of at least one service level parameter; and

[8.g] dynamically reallocating said plurality of resources between said plurality of computing domains by the first manager process in response to received requests for additional resources according to service level parameters.

Ex. 1001, 15:46–16:3; Pet. 77.

C. Asserted Challenges to Patentability and Evidence of Record

Petitioner challenges the patentability of claims 1–20 of the ’005 patent based on the following references:

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1–20	103 ¹	McCarthy, ² Gien ³
1, 6, 8	102/103	McCarthy

Pet. 4. In support of its patentability challenge, Petitioner relies on, *inter alia*, the Declaration of Vijay K. Madisetti, Ph.D. Ex. 1003 (“Madisetti Decl.”).

D. Real Parties in Interest

Petitioner identifies itself as a real party in interest. Pet. xiii. Patent Owner states:

Valtrus Innovations Limited (“Valtrus”) is the owner of U.S. Patent No. 7,748,005 (“the ’005 patent”). Valtrus Innovations Limited is a subsidiary of Key Patent Innovations Limited. Both Key Patent Innovations Limited and Valinvest LLC are financially interested in the outcome of the litigation between Valtrus and Google. Paper 4, 1.

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 as of March 16, 2013. The application for the ’005 patent was filed before March 16, 2013, and therefore we apply the pre-AIA version of 35 U.S.C. § 103.

² McCarthy, et al., US 2003/0037092 A1, published February 20, 2003 (“McCarthy,” Ex. 1013).

³ Michel Gien & Lori Grob, “*Micro-kernel Based Operating Systems: Moving UNIX onto Modern System Architectures*,” Proceedings of the UniForum ’92 Conference, pp. 45–55 (1992). (“Gien,” Ex. 1014, Ex. A).

E. Related Proceedings

The parties identify the following related proceedings: *Valtrus Innovations Ltd. v. Google LLC*, Case No. 3:22-cv-00066 (N.D. Tex.) (“the Texas case”); *Valtrus Innovations Ltd. v. Google LLC*, Case No. 4:22-cv-00020 (N.D. Tex.); *Google LLC v. Valtrus Innovations Limited*, IPR2022-01408 (“IPR1408”); *Unified Patents, LLC v. Valtrus Innovations Limited*, IPR2022-01399 (“IPR1399”). Pet. xvi–xvii; Paper 4, 1–2.

III. ANALYSIS OF PETITIONER’S CHALLENGE

A. Legal Standards

To prevail in its challenge, Petitioner must demonstrate by a preponderance of the evidence that the claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). “In an IPR, the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (2012) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”). This burden of persuasion never shifts to the patent owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review).

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros., Inc. v. Union Oil Co. of Cal.*, 814 F.2d 628, 631 (Fed. Cir. 1987). “The identical invention must be shown in as complete detail as is contained in the . . . claim.” *Richardson v.*

Suzuki Motor Co., 868 F.2d 1226, 1236 (Fed. Cir. 1989). “These elements must be arranged as in the claim under review, but this is not an ‘ipsissimis verbis’ test.” *In re Bond*, 910 F.2d 831, 832 (Fed. Cir. 1990) (citations omitted).

A patent claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective indicia of non-obviousness (also called secondary considerations), such as commercial success, long-felt but unsolved needs, and failure of others.⁴ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We analyze grounds based on obviousness in accordance with the above-stated principles.

B. Level of Ordinary Skill in the Art

In determining whether an invention would have been obvious at the time it was made, 35 U.S.C. § 103(a) requires us to resolve the level of ordinary skill in the pertinent art at the time of the invention. *Graham*, 383 U.S. at 17. The person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention.

⁴ No evidence of secondary consideration appears in the record for us to consider at this stage of the proceeding

In re GPAC Inc., 57 F.3d 1573, 1579 (Fed. Cir. 1995). Factors that may be considered in determining the level of ordinary skill in the art include, but are not limited to, the types of problems encountered in the art, the sophistication of the technology, and educational level of active workers in the field. *Id.* In a given case, one or more factors may predominate. *Id.*

Petitioner asserts that a person of ordinary skill in the art as of the September 10, 2004 filing date of the '005 patent:

would have had at least a Bachelor's degree in Computer Science, Computer Engineering, or related field, with three years of experience in the area of virtualization and distributed computer systems, including performance and/or resource optimizations. . . . A higher level of education may substitute for less experience. . . . A POSA's level of skill would not differ materially between the '005 patent's earliest possible priority date (in 2000) and its filing date (in 2004). . . .

Pet. 8 (citing Madisetti Decl. ¶ 61). Patent Owner does not specifically address the level of ordinary skill in the pertinent art at the time of the invention. *See generally* Prelim. Resp.

Petitioner's proposal is consistent with the level of ordinary skill in the art reflected by the asserted prior art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *GPAC*, 57 F.3d at 1579. On this record, the level of ordinary skill is neither in dispute nor dispositive of any challenge. For purposes of this Decision, we apply Petitioner's articulation.

C. Claim Construction

The Petition was accorded a filing date of August 17, 2022. Paper 6, 1. In an *inter partes* review for a petition filed on or after November 13, 2018, a claim "shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b)."

37 C.F.R. § 42.100(b). We apply the claim construction standard from *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc).

Claim terms need only be construed to the extent necessary to resolve the controversy. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Matal*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

The only claim term for which Petitioner proposes an explicit construction is “virtual machine” — Petitioner argues that a person of ordinary skill in the art “would have understood ‘virtual machines’ in the ’005 patent as meaning software that mimics or emulates a complete computer system.” Pet. 12 (citing Ex. 1011, 471; Ex. 1012, 966; Ex. 1015, 1256 & 1054; Ex. 1017, 2:18–25; Madisetti Decl. ¶¶ 101–102). However, for the issue of whether the McCarthy application is prior art (discussed below), Petitioner also argues that “[n]o exact outer boundary interpretation [of virtual machine] is needed, because under any reasonable interpretation no parent application to the ’005 patent supports the full scope of any Challenged Claim and the prior art meets the Challenged Claims.” *Id.* at 9.

Patent Owner points out that, in a joint claim construction chart submitted in the Texas case, the parties offered competing constructions of “virtual machines,” neither of which is the construction Petitioner proposes here:

- “[a] set of virtual resources created as software constructs” (Patent Owner);
- “software that mimics or emulates hypothetical hardware computer devices” (Petitioner).

Prelim. Resp. 18 (citing Ex. 2009, 28).

In support of its trial court definition, Patent Owner argues that “[t]he ’005 Patent describes ‘virtualization’ as the ‘creation of virtual machines’

then defines ‘virtualization’ as ‘software creat[ing] virtual resources as software constructs.’” *Id.* at 21 (citing Ex. 1001, 13:40–46). But in fact, the ’005 patent states that “virtualization *refers* to the creation of virtual machines.” Ex. 1001, 13:42 (emphasis added). And the next sentence following the reference to “software constructs” states, “[t]he virtual resources are *then* assigned to virtual machines used for respective servers.” Ex. 1001, 13:46–48 (emphasis added). Thus “virtualization” refers to both creating virtual machines and assigning virtual resources to virtual machines, and Patent Owner’s definition of “virtual machine” as “virtual resources created as software constructs” is overbroad.

On the other hand, we agree with Patent Owner that “while an emulated or mimicked complete computer system is certainly a category of virtual machine, “virtual machines” are not so limited.” Prelim. Resp. 21. Although we do not need to define the full scope of “virtual machine” for purposes of this Decision, we interpret “virtual machine” as encompassing software that mimics or emulates at least the basic functionality of a computer processor, but that merely virtualizing a resource such as memory or I/O devices, without more, does not create a virtual machine. The current record is consistent with our approach:

The heart of a VM system is the virtual machine monitor (VMM) software which transforms the single machine interface into the illusion of many. Each of these interfaces (virtual machines) is an efficient replica of the original computer system, complete with all of the processor instructions . . . and system resources (i.e., memory and I/O devices). Ex. 1008, 36.

virtual machine n. Software that mimics the performance of a hardware device, such as a program that allows applications written for an Intel processor to be run on a Motorola chip. Ex. 1011, 471.

virtual machine (software) A functional simulation of a computer and its associated devices. Ex. 1015, 1256.

[T]he virtual machine (VM) . . . also known as a “virtual computer” — is a software implementation of a complete computer system. In the VM, the physical system components of a “real” computer are emulated in software, that is, they are virtualized. Ex. 1016 ¶ 23.

The terms emulator and virtual machine are sometimes used interchangeably to denote the ability to mimic or emulate the hardware architecture of an entire computer system. As an example, the Virtual PC software created by Connectix Corporation of San Mateo, Calif. emulates an entire computer that includes an Intel 80x86 Pentium processor and various motherboard components and cards. Ex. 1017, 2:22–29.

Virtual machine monitors (VMMs) implement in software a virtual machine identical to the underlying hardware. Ex. 1030, 2:36–67.

See also Madisetti Decl. ¶¶ 101–112.

Patent Owner also points out that the parties in the Texas case proposed constructions for a number of other claim terms that are not specifically proposed here. Prelim. Resp. 17–18. Additionally, Patent Owner argues, “Petitioner also peppers its petitions with thinly veiled constructions in its merits analysis.” *Id.* at 19. Nonetheless, Patent Owner argues that “most of these constructions are not necessary at this stage to address institution.” *Id.* at 20. To the extent necessary, we address any disagreements between the parties that implicitly hinge on additional claim scope issues in the merits analysis below.

D. Prior Art Status of McCarthy

1. Petitioner's Arguments

As indicated in Section II.A above, the '005 patent is a continuation-in-part of the McCarthy application. McCarthy was published February 20, 2003. Ex. 1013, code (43). Petitioner argues that none of the claims issued from the '005 application, filed on September 10, 2004, more than a year after the publication of the McCarthy application, are entitled to priority based on McCarthy, because McCarthy does not include written description support for the '005 claims, and therefore McCarthy is effective prior art to the '005 patent per pre-AIA 35 U.S.C. § 102(b). Pet. 1–4, 6–8, 10–17, 24, 58–65.

To establish priority based on McCarthy, that application must provide written description support for the '005 claims. *Dynamic Drinkware*, 800 F.3d at 1379–80. To satisfy the written description requirement, McCarthy must describe the claimed '005 invention in sufficient detail that one skilled in the art can reasonably conclude that the inventor had possession of the claimed invention at the time of filing. *Reiffin v. Microsoft Corp.*, 214 F.3d 1342, 1345 (Fed. Cir. 2000). It is irrelevant to the written description analysis whether a person of ordinary skill in the art would have found the '005 claimed subject matter obvious in light of McCarthy. *Lockwood v. Am. Airlines Inc.*, 107 F.3d 1565, 1571–72 (Fed. Cir. 1997).

McCarthy includes all of the figures and accompanying description of the physical partition embodiment of the '005 patent, but does not mention virtual machines and does not include any of the portions of the '005 patent pertaining to the virtual machine embodiment. Pet. 10; *see* Ex. 1010

(“redline” comparison of written disclosure in ’005 and U.S. Patent No. 7,140,020).⁵ Therefore, argues Petitioner, there is no written description support for the dependent ’005 claims that explicitly require virtual machines — *i.e.*, claims 2–5, 9–14 and 16–18 (hereafter, the “VM claims”). Pet. 1–2, 6–7, 10–17.

Also, independent claims 1, 8, and 15, and dependent claims 6, 7, 19, and 20 (hereafter, the “computer domain claims”), while not limited to virtual machines, nevertheless cover virtual machine embodiments based on the “computer domains” requirement of these claims, because “computer domains” encompass virtual machines, given that dependent claims 2, 9, and 16 require that the computing domains be virtual machines. Pet. 2, 7, 58–59. Thus, Petitioner argues that McCarthy does not support priority for these claims, because its written description does not support their full scope, which includes virtual machines as well as physical partitions. *See D Three Enterprises v. SunModo Corp.*, 890 F.3d 1042, 1048–50 (Fed. Cir. 2018); *Rivera v. Int’l Trade Comm’n*, 857 F.3d 1315, 1319–21 (Fed. Cir. 2017). *Id.* at 59–65. On the other hand, because these claims also cover physical partitions, Petitioner relies on McCarthy as pertinent prior art to the computer domain claims. *Id.* at 2–3, 65–67. *See Chester v. Miller*, 906 F.2d 1574, 1577 (Fed. Cir. 1990) (“no impermissible anomaly or logical inconsistency” in treating parent application as prior art that invalidates “broader claims” it did not adequately describe).

Petitioner provides detailed argument, relying on the testimony of its declarant Dr. Madisetti, that McCarthy’s disclosure is limited to the physical

⁵ McCarthy issued as U.S. Patent No. 7,140,020. Ex. 1005, code (65).

partition embodiment also described in the '005 patent. Pet. 13–17 (citing Madisetti Decl. ¶¶ 113–132). Petitioner submits that McCarthy confirms that partitions are made up of physical hardware:

Large computer systems, e.g. those with multiple processors, multiple I/O resources, multiple storage resources, etc., can be separated into partitions or protected domains. These partitions are **hardware** separations that place resources into separate functional blocks.

Pet. 14 (citing Ex. 1013 ¶ 8 (emphasis added)). Petitioner's declarant Dr. Madisetti submits that a partition is "a collection of hardware." Madisetti Decl. ¶ 116; *see also id.* ¶¶ 113–115, 116–121. Dr. Madisetti testifies that one of ordinary skill "would have understood [McCarthy's] partitions cannot be a VM because the partition can include physical resources, while a VM is software (i.e., not a physical resource) that emulates a computer system." Madisetti Decl. ¶ 122; *see also id.* ¶¶ 123–132.

Petitioner acknowledges that McCarthy is titled "Dynamic Management Of *Virtual* Partition Computer Workloads Through Service Level Optimization." Pet. 14 (emphasis supplied). But Petitioner argues that this only refers to the sole occurrence of the word "virtual" in the McCarthy specification: "the partitions may be virtual, as the multiple partitions may reside in one or more physical computers." *Id.* (citing Ex. 1006, 4:62–63, corresponding to Ex. 1013, ¶ 24). Petitioner relies on Dr. Madisetti, who testifies that this passage does not describe or suggest that partitions can be virtual machines, but rather simply states that partition hardware can be located in more than one computer. *Id.* at 14–15 (citing Madisetti Decl. ¶¶ 123–124, *see also id.* ¶¶ 127, 146–147).

As Petitioner notes, to provide written description support for claims requiring “computer domains” as a genus encompassing at least a species of “partition” embodiments and a species of “virtual machine” embodiments, McCarthy must disclose either (1) “structural features common to the members” of the genus (computing domains) or (2) “a representative number of species falling within the scope” of the genus so that a person of ordinary skill “can visualize or recognize the members of the” computing domain. *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1350 (Fed. Cir. 2010). Petitioner argues that nothing in McCarthy provides a basis for finding that it discloses a genus of systems allocating resources to computing domains that would encompass virtual machines as one species of the genus. Pet. 60–65 (citing Madisetti Decl. ¶¶ 117–119, 310–314). In particular, in addition to the above arguments regarding the lack of disclosure of “virtual machines,” Petitioner argues that McCarthy makes no mention of “computer domains” and never describes using its resource allocation methods in anything other than partitions, does not provide “structural features common to the members” of a “computing domains” genus that expressly includes virtual machines, and does not describe a representative number of species falling within the scope of “computing domains.” *Id.*

2. *Patent Owner’s Response*

Patent Owner argues that “McCarthy discloses computing domains that include ‘virtual machines’ through its software-based ‘virtual partitions’ . . . under any possible definition.” Prelim. Resp. 4. Patent Owner asserts that Petitioner relies on an overly narrow definition of “virtual machine” as a completely emulated computer system. *Id.* Patent Owner concedes that disclosure of the use of a specific type of virtual machine was added to the

'005 patent, but asserts that it is one specific implementation of McCarthy's "virtual partition" embodiment. *Id.* at 12–13.

Patent Owner argues that written description does not require the use of the exact terms (*in haec verba*) or listing "every conceivable" permutation of an invention. Prelim. Resp. 37 (citing *Cordis Corp. v. Medtronic AVE, Inc.*, 339 F.3d 1352, 1364–65 (Fed. Cir. 2003)). Patent Owner asserts that the virtual partitions referred to in McCarthy, like virtual machines, "enable isolation, segregation, fault protection, and survivability between the protected domains." *Id.* at 38 (citing Ex. 1013 ¶¶ 8, 18, 25, 34). Patent Owner characterizes McCarthy as stating that the "present invention" may be "implemented in software," which Patent Owner argues refutes Petitioner's characterization of partitions as limited to hardware embodiments. *Id.* at 39, 43 (citing Ex. 1013 ¶ 57).

Patent Owner notes that the partitions of McCarthy are "made up of all of these classical components of a complete computer systems: a processor, storage, input/output devices, an operating system, and other resources," and from that argues that the partitions satisfy Petitioner's definition of virtual machine as "mimic[ing] or emulate[ing] a complete computer system." Prelim. Resp. 40–41. Patent Owner also submits that during the prosecution of McCarthy the examiner searched for prior art with terms that included "virtual machine" and even classified McCarthy under "Virtual Machine Task or Process Management or Task Management/Control" Prelim. Resp. 42.

Patent Owner disputes Petitioner's argument that the reference in McCarthy to virtual petitions merely refers to a partition being located in more than one computer. Prelim. Resp. 43–44. In particular, Patent Owner

argues that this statement also refers to multiple partitions residing in one physical computer, and therefore “the partitions must be virtual.” *Id.*

Responding to Petitioner’s argument that partitions cannot be a virtual machine because the “partitions can include physical resources” and “physical resources are not software,” Patent Owner argues that a virtual machine can include or access physical resources and does not need to emulate all resources of a complete computer system. Prelim. Resp. 45–47 (citing Ex. 1008, 35, 37, 39–40; Ex. 1017, Abstr., Fig. 3, 3:34–65, 5:51–52; Ex. 1016 ¶¶ 40–42).

3. *Analysis*

At this stage of the proceeding, we agree with Petitioner, and its declarant Dr. Madisetti, that McCarthy does not provide written description support for the ’005 claims. McCarthy makes no mention of virtual machines and there is nothing in McCarthy that would suggest to one of ordinary skill in the art that the applicants had in mind the use of virtual machines as an embodiment of their invention. Our determination is informed by our interpretation, discussed in Section III.C above, that “virtual machine” encompasses software that mimics or emulates at least the basic functionality of a computer processor, but that merely virtualizing a resource such as memory or I/O devices does not create a virtual machine. Patent Owner’s attorney arguments are unpersuasive as citing irrelevant examples of virtual machines that interact with physical resources such as a host computer, memory or I/O devices, but which nevertheless mimic or emulate at least the basic functionality of a computer processor, unlike the partitions of McCarthy, which physically contain computer processors. McCarthy

narrowly describes physical partitions, which do not mimic or emulate a computer processor and are not virtual machines.

We understand that the statement in McCarthy that the “present invention” may be “implemented in software” (at paragraph 57 of McCarthy) merely refers to the fact that such components as the PLM, WLM, and performance monitor are software modules running on physical processors. We also agree with Petitioner that the reference to virtual partitions in McCarthy refers to the possibility that a partition hardware can be located in more than one computer, and has nothing to do with the use of virtual machines. Reply 2. Nor are we persuaded that the possibility of more than one partition residing in a single computer means that the partitions must be virtual, given that multiple processors can be in a single computer and a single processor can be partitioned by physically allocating its resources to multiple processes. Ex. 1013, Figs. 1A, 1B, ¶¶ 4, 8.

As Petitioner argues, the ’005 patent explicitly distinguishes virtual machines from partitions as two separate species of the computer domain genus:

Although some representative embodiments have been described in terms of allocating physical resources between partitions, representative embodiments may allocate resources between any suitable computing domain. Another suitable computing domain is a virtual machine.

Reply 2 (citing Ex. 1001, 13:37–41). Unlike the ’005 patent, McCarthy confines its disclosure to partitions, and makes no mention of a computer domains genus or a virtual machines species.

Accordingly, we determine, on the current record and for purposes of this decision, that the information presented in the Petition demonstrates a

reasonable likelihood that Petitioner will prevail in establishing that McCarthy is prior art to the '005 patent claims.⁶

E. Alleged Anticipation of Claims 1, 6, and 8 by McCarthy

Petitioner challenges claims 1, 6, and 8 as anticipated by McCarthy. Pet. 4, 36–45, 49–52, 65–68.⁷

Following Petitioner's approach, we first consider claim 8, and for economy of presentation refer to the bracketed identifiers applied to the claim limitations by Petitioner (*see* Section II.B above). Pet. 36–45.

For the method preamble of claim 8, Petitioner generally relies on McCarthy's method for managing computer resource allocations. Pet. 36 (citing Ex. 1013, Abstr., Fig. 3, ¶ 9, claims 9–18; Madisetti Decl. ¶¶ 196–199).⁸

For requirement 8.a of claim 8 regarding creation of computer domains, Petitioner relies on the description in McCarthy of the use of partitions, which McCarthy describes as “protected domains.” Pet. 37 (citing Ex. 1013 ¶ 8; Madisetti Decl. ¶¶ 117–119, 202–204).

⁶ Given that the '005 patent does not benefit from McCarthy's filing date, it follows that it does not benefit from the Jan. 28, 2000 filing date of its earlier continuation-in-part application No. 09/493,753. MPEP 211.05(1)(B) (“If there is a continuous chain of copending nonprovisional applications, each copending application must disclose the claimed invention of the later-filed application in the manner provided by 35 U.S.C. 112(a) in order for the later-filed application to be entitled to the benefit of the earliest filing date”).

⁷ The cited pages include arguments supporting Petitioner's anticipation challenges interspersed with its obviousness challenges.

⁸ Based on the present record, we make no determination at this stage of the proceeding that the preamble of claim 8 (or of claim 1) is limiting.

For requirement 8.b of claim 8 regarding allocating resources between computing domains by a first manager process, Petitioner relies on the disclosure in McCarthy of the PLM. Pet. 38 (citing Ex. 1013, ¶¶ 19, 21, 26, 41; Madisetti Decl. ¶¶ 207–208).

For requirement 8.c of claim 8 regarding executing applications, a second manager process, and a performance monitor in each domain, Petitioner relies on the disclosure that each partition in McCarthy includes execution of applications, a WLM (the second manager process) and a performance monitor. Pet. 38–39 (citing Ex. 1013, Fig. 2B, ¶¶ 20, 31–32; Madisetti Decl. ¶¶ 211–212).

For requirement 8.d of claim 8 regarding the second manager process maintaining a list of priority levels and needed resources, Petitioner relies on the disclosure in McCarthy that “[a] partition, preferably through its WLM, maintains a list of prioritized application goals with an indication of the quantity of each required resource. . . .” Pet. 39 (citing Ex. 1013 ¶ 23; Madisetti Decl. ¶ 215) (emphasis omitted).

For requirement 8.e of claim 8 regarding performance monitoring, Petitioner relies on the disclosure in McCarthy of performance monitoring in each partition. Pet. 41 (citing Ex. 1013, Fig. 2B, ¶ 32; Madisetti Decl. ¶ 221).

For requirement 8.f of claim 8 regarding the second manager process requesting additional resources, Petitioner relies on the disclosure in McCarthy that WLM receives “goal information and priority information from a user or administrator” and “performance information from performance monitors,” “compares the [performance] information with the goals,” and “[b]ased on the comparison, the WLM may increase, decrease,

or leave unchanged, an application’s entitlement.” Pet. 42–43 (citing Ex. 1013, Fig. 2B, ¶ 20; Madisetti Decl. ¶¶ 230–231).

For requirement 8.g of claim 8 regarding dynamic reallocation of resources by the first manager process, Petitioner relies on the disclosure in McCarthy of PLM dynamically reallocating resources as claimed. Pet. 43–44 (citing Ex. 1013, Fig. 3, ¶¶ 24, 27, 28, 35; Madisetti Decl. ¶¶ 236–237).

Independent claim 1 is a computing system counterpart to method claim 8, and includes requirements substantially the same as those of claim 8. Ex. 1001, 15:4–25. Petitioner essentially repeats its arguments made for claim 8, and also cites disclosure in McCarthy to the effect that the disclosed system can be implemented via “program or code segments” on a “processor readable medium.” Pet. 49–52 (citing Madisetti Decl. ¶¶ 266–277).

Claim 6 adds to claim 1 the requirement that the “plurality of resources comprise at least one processor.” Ex. 1001, 15:40–41. Petitioner relies on the disclosure in McCarthy that the allocation of resources by PLM includes allocation of processors. Pet. 68 (citing Ex. 1013, claim 2, ¶ 41; Madisetti Decl. ¶¶ 207–208, 318–319, 331–333).

Other than disputing the prior art status of McCarthy, which argument as discussed above we do not find persuasive at this stage, Patent Owner does not specifically respond to any other of Petitioner’s arguments regarding the requirements of claims 1, 6, and 8. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378. We determine, on the current record and for purposes of this decision, that the information presented in the Petition

demonstrates a reasonable likelihood that Petitioner will prevail in establishing that claims 1, 6 and 8 are anticipated by McCarthy.

F. Alleged Obviousness of Claims 1–20 over McCarthy and Gien

Petitioner challenges claims 1–20 as obvious in light of the combination of McCarthy and Gien. Pet. 4, 10–67.

1. Gien

Gien, titled “Micro-Kernel Based Operating Systems: Moving UNIX onto Modern System Architectures,” is a paper presented at the “UniForum 1992 Conference Proceedings” in January, 1992. Ex. 1014, Ex. A. Petitioner presents evidence and argument directed to the public availability of Gien as pre-AIA 35 U.S.C. § 102(b) prior art to the ’005 patent. Pet. 24–25 (citing Ex. 1014, Statutory Declaration of Anthony William Corsini & Ex. A). Patent Owner argues that the Corsini declaration, and Gien, are inadmissible “for lack of a perjury and warning statement.” Prelim. Rep. 13 (citing 18 U.S.C. § 1001; 28 U.S.C. § 1746; 37 C.F.R. §§ 1.68, 42.2). However, the declaration is made in London pursuant to the United Kingdom Statutory Declarations Act 1835. In addition, the Declaration of James L. Mullins supports a finding of public accessibility of Gien. Ex. 1029. At this stage, we accord Gien prior art status.⁹

⁹ Although we do not address at this stage whether additional evidence on this issue would be called for, we note that under similar circumstances supplemental declarations have been allowed. *Hulu v. Sound View Innovations*, IPR2018-01039, Paper 29 (Dec. 20, 2019): “[I]f the patent owner challenges a reference’s status as a printed publication, a petitioner may submit a supporting declaration with its reply to further support its argument that a reference qualifies as a printed publication. See 37 C.F.R. §§ 42.2 (affidavit), 42.23.”

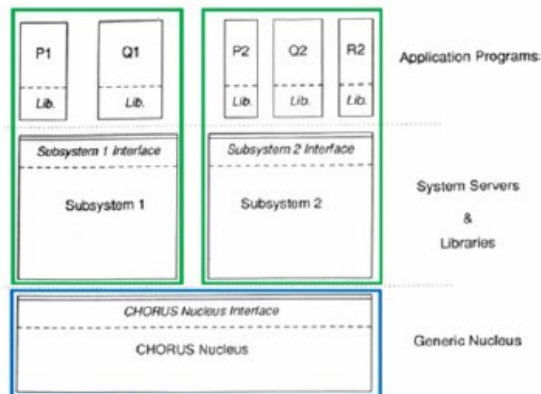
Gien describes a “CHORUS operating system” as “[o]ne approach to modern operating system design,” in which:

[The approach] is to build the distributed operating system as a set of independent system servers using the primitive, generic services of a micro-kernel. The micro-kernel provides a virtual machine for processor use, memory allocation and communication between operating system components.

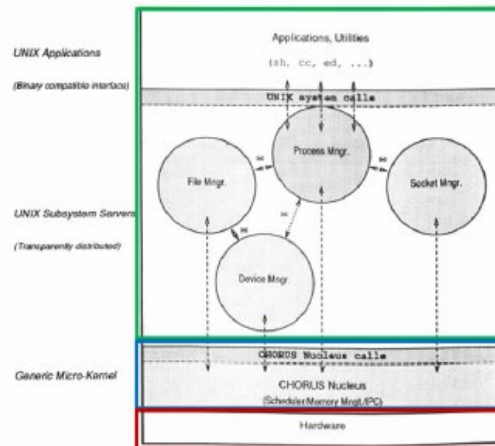
Ex. 1014 at 47. The CHORUS micro-kernel, called a “nucleus,” provides “core operating system services,” and “distributed computing built into [the] virtual machine layer.” *Id.* at 47–48. The nucleus “provides generic tools — thread scheduling, real time event handling, network-transparent inter-process communications (IPC) and virtual memory management — to sets of independent servers called subsystems, which coexist on top of the Nucleus.” *Id.* at 48. “Subsystems separate the functions of the operating system into sets of services provided by autonomous servers, and provide operating system interfaces to application programs.” *Id.* Gien further describes the subsystems:

Subsystems in CHORUS architecture are sets of system servers that use the generic services of the Nucleus to provide higher-level services. More simply, a subsystem is an operating system built on top of the CHORUS Nucleus.

Id. at 49. Gien Figures 2 and 3 are reproduced below, with annotations applied by Petitioner’s declarant Dr. Madisetti.



Annotated Gien Fig. 2.



Annotated Gien Fig. 3.

Madisetti Decl. 167. Dr. Madisetti testifies that the “green boxes mark VMs, blue boxes mark the host OS, and red boxes mark server hardware.” *Id.* Dr. Madisetti further testifies that “Gien’s CHORUS Nucleus is a host OS,” that the CHORUS micro-kernel “‘virtual machine layer’ is a virtualization software layer that provides VMs,” and that one of ordinary skill would have recognized that the “application programs on top of a subsystem, represent multiple VMs,” and that the “‘subsystem servers’ are guest OSs instantiated on single server hardware.” *Id.* ¶¶ 165–166, 168.

2. The Combination of McCarthy and Gien

Petitioner argues that a person of ordinary skill would have been motivated to replace the physical partitions of McCarthy with virtual machines using Gien’s host OS, allowing McCarthy’s WLM and performance monitor processes to execute with applications and a PLM process in the application layer in each virtual machine. Pet. 29 (citing Madisetti Decl. ¶¶ 171–173. Petitioner argues that the use of virtual

machines “facilitates server consolidation, provides faster application deployment and better resource utilization, simplifies management, improves flexibility and scalability, and provides more efficient development environments, compared to using physical hardware partitions.” Pet. 29 (citing Ex. 1023, 6; Ex. 1034, 2; Madisetti Decl. ¶¶ 173–176). Petitioner provides detailed testimony from its declarant, Dr. Madisetti to this effect. Pet. 30–32 (citing Madisetti Decl. ¶¶ 177–183). Petitioner offers evidence that there would have been a reasonable expectation of success in making the combination. Pet. 32–35 (citing Madisetti Decl. ¶¶ 184–192).

Patent Owner argues that the Gien micro-kernel, in contrast to “monolithic kernels,” has limited features and is not a complete operating system. Prelim. Resp. 14–15. Patent Owner further argues that the Gien micro-kernel approach “proved to be unacceptably inefficient,” and was ultimately rejected by the market in favor of the monolithic approach. *Id.* at 15. Patent Owner cites references that it characterizes as disparaging micro-kernels. *Id.* at 16 (citing Ex. 2005, 1; Ex. 2006, 2–3; Ex. 2007, 62 ; Ex. 2008, 159–160); to like effect, *id.* at 68–71 (with additional citations to Ex. 2002, 1; Ex. 2003, 180; Ex. 2017, 71; Ex. 2018, 261; Ex. 2019, 14). Thus, argues Patent Owner, one of ordinary skill would not have been motivated to combine McCarthy with the Gien approach. *Id.*

Patent Owner also argues that there would have been no motivation to combine McCarthy with Gien because the partitions of McCarthy are themselves virtual machines, and so there would not have been any reason to turn to Gien. Prelim. Resp. 60–61. As discussed above in Section III.D, we are not persuaded that McCarthy’s partitions are virtual machines, and

therefore this argument is unpersuasive. Patent Owner further argues that the Gien micro-kernel approach does not provide the various benefits cited by Petitioner (solving resizing costs, improving scalability, savings from server consolidation, and supporting portability), because of its limited capabilities compared with monolithic systems. *Id.* at 61–62, 65. In addition, Patent Owner submits that the McCarthy system already provides the improvements in resizing costs, scalability, server consolidation, and portability that Petitioner attributes to the combination, thus also negating any motivation for the combination. *Id.* at 62–67.

At this stage of the proceeding, we are not persuaded by Patent Owner’s attorney arguments, which in large part focus on specific details of the CHORUS system of Gien, whereas Petitioner relies on the combination of McCarthy and Gien. *In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986); *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). “The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference. . . . Rather, the test is what the combined teachings of those references would have suggested to those of ordinary skill in the art.” *In re Keller*, 642 F.2d at 425; *In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012). “Combining the *teachings* of references does not involve an ability to combine their specific structures.” *In re Nievelt*, 482 F.2d 965, 968 (CCPA 1973).

We credit the testimony of Petitioner’s expert Dr. Madisetti, which provides adequate support for Petitioner’s asserted combination. Moreover, Petitioner’s obviousness analysis is supported by the prosecution history of the ’005 patent, during which, as discussed below in Section IV.B, the Examiner cited references disclosing virtual machines in finding the then-

pending claims obvious. Ex. 1002, 47–59. Applicants overcame that rejection by amending the claims to add the requirement that the second manager process maintain a list of priority levels and quantity of needed resources (a requirement now satisfied by McCarthy). *Id.* at 113–115, 181–192. But the basic finding of the Examiner that virtual machines were a well-known and obvious technique at the time of the ’005 invention supports Petitioner’s challenge.

Accordingly, for purposes of this Decision, we determine that Petitioner has provided sufficiently articulated reasoning with rational underpinnings for the proffered combination of McCarthy and Gien.

3. *Alleged Obviousness of the Computer Domain Claims
(Claims 1, 6–8, 15, 19, and 20)*

As discussed in Section III.D.1 above, independent claims 1, 8, and 15, and dependent claims 6, 7, 19, and 20, do not require a virtual machine, but encompass computer domains that are made up of virtual machines. Therefore, argues Petitioner, these “computer domain” claims are obvious over the combination of McCarthy and Gien. Pet. 58–67. In fact, although Petitioner characterizes its challenges to these claims as being obvious over the combination of McCarthy and Gien, Petitioner’s arguments rely on McCarthy alone for each claim (satisfying the partition embodiments of “computer domains”), although in some cases Petitioner offers alternative arguments including Gien (satisfying the virtual machine embodiments). *See generally* Pet. 65–67. We do not need to consider the latter.

For this Decision, we also do not need to consider Petitioner’s obviousness arguments directed against claims 1, 6, or 8 because, as set forth above in Section III.E, we have determined that the Petition demonstrates a

reasonable likelihood that Petitioner will prevail in establishing that claims 1, 6, and 8 are anticipated by McCarthy.

Independent claim 15 is a computer readable storage medium counterpart to method claim 8, and includes requirements substantially the same as those of claim 8. Ex. 1001, 16:25–46. Petitioner essentially repeats its arguments made for claim 8, and also cites disclosure in McCarthy to the effect that the disclosed system can be implemented via “program or code segments” on a “processor readable medium.” Pet. 54–56, 66 (citing Madisetti Decl. ¶¶ 287–296, 321).

Claim 7 adds to claim 1 (via claim 6, discussed above) the requirement that the “first manager allocates time slices of said at least one processor between multiple computing domains of said plurality of computing domains,” and claim 20 adds a commensurate requirement to claim 15 (via claim 19, discussed below). Ex. 1001, 15:43–45; 16:60–63. Petitioner relies on the disclosure in McCarthy of allocating shares of CPU resources to applications in terms of fractions of a CPU operating second, which was known in the art as a “time slice.” Pet. 48–49, 66, 67 (citing Ex. 1013 ¶¶ 33–34, 42; Ex. 1024 ¶ 20; Madisetti Decl. ¶¶ 260–261, 320, 323).

Claim 19 adds to claim 15 the requirement that “said resources comprise processors.” Ex. 1001, 16:58–59. Petitioner refers to arguments directed to claim 6, discussed above, in which Petitioner relies on the disclosure in McCarthy that the allocation of resources by PLM includes allocation of processors. Pet. 66 (citing Madisetti Decl. ¶ 322).

In response, Patent Owner repeats its argument that McCarthy is not prior art, and therefore claims 1, 6–8, 15, 19, and 20 are not invalid. Prelim. Resp. 52. As discussed, we are not persuaded by that argument. Patent

Owner also argues that Petitioner’s challenges to these claims is based on an inadequate “single reference obviousness ground,” which fails to provide “a full obviousness analysis to support its obviousness grounds based solely on disclosures of McCarthy.” *Id.* at 52–55. Patent Owner explains that “Petitioner never identifies any potentially missing element or a motivation to modify McCarthy to address any purported missing elements.” *Id.* at 54.

But Patent Owner acknowledges that “McCarthy provides full written description support for these claims.” *Id.* at 55. Although, as discussed, McCarthy does not provide written description support for the full breadth of these claims, it does disclose, and thus teaches, a physical partition embodiment of the claims. “[I]t is well settled that a disclosure that anticipates under § 102 also renders the claim invalid under § 103, for anticipation is the epitome of obviousness.” *Realtime Data v. Iancu*, 912 F.3d 1368, 1373 (Fed. Cir. 2019). It makes no sense to require Petitioner to identify hypothetical differences between McCarthy and the subject matter of these claims when there are no such differences.

Accordingly, having reviewed Petitioner’s arguments and supporting evidence in the present record, we determine Petitioner has demonstrated a reasonable likelihood that Petitioner will prevail in establishing that claims 6, 7, 15, 19, and 20 would have been rendered obvious to a person of ordinary skill in the art by the disclosures in McCarthy, and *ipso facto* by the combination of McCarthy and Gien.

4. *Alleged Obviousness of the VM claims (claims 2–5, 9–14, and 16–18)*

Petitioner argues that the combination of McCarthy and Gien renders obvious claims 2–5, 9–14, and 16–18. Pet. 4, 10–57.

Claims 2 and 16 add to claims 1 and 15, respectively, the requirement that “said plurality of computing domains are virtual machines.” Ex. 1001, 15:26–27, 16:47–49. Claim 9 adds to claim 8 the requirement of “creating multiple virtual machines from a single server platform using a virtualization software layer.” *Id.* at 16:4–7. Petitioner relies on the disclosures in Gien of the use of virtual machines and using the CHORUS micro-kernel “virtual machine layer” to provide virtual machines. Pet. 45, 52, 56 (citing Ex. 1014, 47; Madisetti Decl. ¶¶ 243, 278, 297–298).

Claim 3 adds to claim 2 the requirement that “said first manager process operates on a host operating system of said computing system.” Ex. 1001, 15:28–30. Claim 10 adds to claim 9 the requirement that “said virtualization software layer is implemented within a host operating system of said single server platform.” *Id.* at 16:8–10. Claim 11 adds to claim 10 the requirement that “said dynamically reallocating is performed by a process executing on top of said host operating system.” *Id.* at 16:11–13. Petitioner relies on the disclosure in Gien of the CHORUS micro-kernel, which is a host OS, and which includes a “virtual machine layer,” and on the combination of McCarthy and Gien in which the PLM of McCarthy executes within the virtual machine application layer of Gien. Pet. 45–46, 52 (citing Ex. 1014, Fig. 3, 47, 51; Madisetti Decl. ¶¶ 154, 165–166, 170, 245–246, 249–250, 280–281). Petitioner argues that one of ordinary skill would have understood that both “executing on top” of the host OS, and “operat[ing] on” the host OS, both mean the first manager process (PLM) uses host OS services (the CHORUS micro-kernel), which is met in the McCarthy/Gien combination. *Id.* at 52 (citing Madisetti Decl. ¶ 154).

Claim 4 adds to claim 3 the requirement that “a respective operating system executes on top of said host operating system for each of said plurality of computing domains.” Ex. 1001, 15:32–34. Claim 12 adds to claim 10 the requirement that “executing a respective guest operating system on top of said host operating system for each of said multiple virtual machines.” *Id.* at 16:14–17. Petitioner relies on the disclosure in Gien of the CHORUS nucleus, which Petitioner argues is the host OS, and on the UNIX Subsystem Servers, which Petitioner argues execute on top of the CHORUS nucleus. Pet. 46, 53 (citing Ex. 1014, 49; Madisetti Decl. ¶¶ 154, 252, 283).

Claim 5 adds to claim 3 the requirement:

[S]aid first manager process allocates said plurality of resources between said plurality of computing domains by assigning virtual resources to said plurality of computing domains through system calls to a kernel of said host operating system.

Ex. 1001, 15:35–39. Claim 13 adds to claim 10 the requirement “said dynamically reallocating comprises: performing system calls to said host operating system to reassign virtual resources.” *Id.* at 16:18–21. Claim 17 adds to claim 16 the requirement “said code for dynamically allocating performs calls to a software virtualization layer to reassign resources between said plurality of computing domains.” *Id.* at 16:50–53. And claim 18 adds to claim 16 the requirement “said code for dynamically allocating performs system calls to a host operating system to reassign resources between said plurality of computing domains.” *Id.* at 16:54–57. For these claims, Petitioner relies on the combination of McCarthy and Gien in which the PLM of McCarthy executes within the virtual machine application layer of Gien and makes system calls to the Gien CHORUS nucleus to allocate

virtual resources as claimed. Pet. 47–48, 53, 57 (citing Ex. 1014, 49; Madisetti Decl. ¶¶ 254–257, 285–286, 300, 302). Petitioner argues that “system call” was a well-known term of art which would have been understood to apply to the McCarthy/Gien combination in this context. Pet. 47–48 (citing Ex. 1014, Fig. 3, 51; Madisetti Decl. ¶¶ 254–255).

Claim 14 adds to claim 10 the requirement “said performing system calls reassigns time slices associated with at least one processor.” Ex. 1001, 16:22–24. Petitioner relies on the disclosure in McCarthy of allocating shares of CPU resources to applications in terms of fractions of a CPU operating second, which was known in the art as a “time slice.” Pet. 48–49, (citing Ex. 1013 ¶¶ 33–34, 42, 48; Ex. 1024 ¶ 20; Madisetti Decl. ¶¶ 260–264).

In support of the validity of the VM claims, Patent Owner disparages Gien, arguing that the Gien micro-kernel has limited features and is not a complete operating system, and that the Gien micro-kernel approach was inefficient and rejected by the market. *See* Section III.F.2 above. In particular, for VM claims 3–5, 10–14, and 18, Patent Owner argues that Gien’s micro-kernel (the “CHORUS nucleus”) is not a host operating system, which is required by those claims. Prelim. Resp. 55–60. Patent Owner argues that Gien identifies the micro-kernel itself is a virtual machine, and furthermore, Gien never identifies the disclosed subsystems as a virtual machine. *Id.* at 56. Therefore, argues Patent Owner, Petitioner’s mapping of the micro-kernel as the host operating system and the subsystems as the guest operating systems fails. *Id.* Patent Owner concedes that the micro-kernel provides core operating service, but argues that it is not enough to be a host operating system. *Id.* at 56–57. At most, argues Patent

Owner, the combination of the micro-kernel and a subsystem make up a single operating system, neither satisfying the requirements for a “host operating system” and a “guest operating system.” *Id.* at 57–58.

In addition, Patent Owner argues that claim 5 differentiates between a host operating system and a kernel of an operating system based on its requirement of “system calls to a kernel of said host operating system.” Prelim. Resp. 58. Also, Patent Owner argues that the requirements of claims 4, 11 and 12 of a guest operating system, or of a dynamic allocation process executing on top of a host operating system, are satisfied because the Gien subsystems are part of the same operating system as the micro-kernel. *Id.* at 59.

At this stage, we are not persuaded by Patent Owner’s attorney arguments, and credit Petitioner’s declarant Dr. Madisetti’s testimony that the Gien CHORUS nucleus (the micro-kernel) is a host operating system and the Gien subsystems are guest operating systems. Madisetti Decl. ¶¶ 165–168. Notwithstanding Patent Owner’s characterization, our understanding, based on Dr. Madisetti’s testimony, is that Gien’s statement, “[t]he micro-kernel provides a virtual machine for processor use, memory allocation and communication between operating system components” (Ex. 1014, 47), establishes that the CHORUS nucleus serves as a host operating system with a virtual machine layer that provides the subsystems as virtual machines with a guest operating system. We find that Gien at least would have taught this arrangement to a person of ordinary skill in the art, as confirmed by the prosecution history of the ’005 application, during which the Examiner likewise found that these aspects of the ’005 claims were obvious in light of similar virtual machine references. *See* Section IV.B below.

Accordingly, having reviewed Petitioner’s arguments and supporting evidence in the present record, we determine Petitioner has demonstrated a reasonable likelihood that Petitioner will prevail in establishing that claims 2–5, 9–14, and 16–18 would have been rendered obvious to a person of ordinary skill in the art by the combination of McCarthy and Gien.

IV. DISCRETIONARY DENIAL OF INSTITUTION

A. Redundant Petitions

Patent Owner argues that we should exercise our discretion to deny institution because “the ’005 Patent is the subject of three petitions and nine duplicative grounds based on recycled references filed by two parties who have been coordinating efforts for years to needlessly increase costs to Patent Owners.” Prelim. Resp. 25. Patent Owner refers to this proceeding as well as IPR1408, both brought by Petitioner, and IPR1399 brought by Unified Patents. *Id.* at 26–27. Patent Owner argues that the IPRs are “needlessly complicated and duplicative,” and that under these circumstances “the Board has ‘discretion to deny institution of the petition as a whole...even when the petition includes at least one claim subject to a challenge that otherwise meets the criteria for institution.’” *Id.* at 25 (citing Trial Practice Guide¹⁰, 64).

Pursuant to the Trial Practice Guide, Petitioner submitted a Notice Ranking Petitions And Explaining Material Differences (“Notice,” Paper 3) ranking this IPR above IPR1408. Petitioner explained that this IPR is premised on the ’005 patent not being entitled to priority of the McCarthy

¹⁰ Patent Trial and Appeal Board Consolidated Trial Practice Guide (Nov. 2019), available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

application, thus making McCarthy prior art, whereas IPR1408 is not so premised, thus relying on other references. Notice 1–2. As Petitioner points out in its Notice, “more than one petition may be necessary” in this situation, where “there is a dispute about priority date requiring arguments under multiple prior art references.” *Id.* at 2 (emphasis omitted) (citing Trial Practice Guide 59).

In regard to the Unified Patent IPR1399, Petitioner states that it “first learned of the Unified petition after it was filed,” and that it “is not a member of Unified Patents, and was not a member when the parallel litigation was filed.” Pet. 70.

In its Response To Petitioner’s Notice Ranking Petitions (“Ranking Response,” Paper 10), Patent Owner argues that, at most, only IPR1408 should be considered, because it does not require resolving the priority date issue that “only affects a handful of claims.” Ranking Response 5.

As discussed above, we have determined that, in the Petition submitted in this proceeding, Petitioner has established a reasonable likelihood of prevailing on its assertion that at least one claim of the ’005 patent is unpatentable. Petitioner is entitled to at least one Petition, and given its election to rank this Petition first, we will not exercise discretion to decline to institute *inter partes* review here, regardless of redundancy or burden issues raised by co-pending IPR1408 and IPR1399, which we will address in those proceedings. Patent Owner’s argument that the priority issue raised here only affects some claims is incorrect — as set forth above, the prior art status of McCarthy is relevant to all the challenged claims.

B. Discretionary Denial Under 35 U.S.C. § 325(d)

Patent Owner argues that institution should be denied pursuant to 35 U.S.C. § 325(d) because the petition presents substantially the same art and arguments previously considered during prosecution of the '005 application. Prelim. Resp. 28–35. Section 325(d) provides that, in determining whether to institute *inter partes* review, “the Director may take into account whether, and reject the petition . . . because, the same or substantially the same prior art or arguments previously were presented to the Office.” In evaluating arguments under Section 325(d), we use

[a] two-part framework: (1) whether the same or substantially the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office; and (2) if either condition of first part of the framework is satisfied, whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims.

Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH, IPR2019-01469, Paper 6 at 8 (PTAB Feb. 13, 2020) (precedential); *see also Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017–01586, Paper 8 at 17–18 (PTAB Dec. 15, 2017) (precedential as to Section III.C.5, first paragraph) (listing factors to consider in evaluating the applicability of § 325(d)).

As to the first prong of the *Advanced Bionics* framework, Patent Owner cites the fact that the '005 patent is a continuation-in-part of McCarthy, both applications had the same primary examiner, the '005 patent expressly incorporates by reference the McCarthy application, and the then-pending claims 1, 8, 15, and 19 of the '005 application claims were rejected for obviousness-type double patenting in view of the patent that issued from

the McCarthy application. Prelim. Resp. 30–31 (citing Ex. 1001, “Primary Examiner,” code (63), 1:7–11; Ex. 1002, 6, 44–45, 76, 80, 84, 112, 116, 184–185; Ex. 2010, 142, 158). Applicants overcame the double patenting rejection by filing a terminal disclaimer. Ex. 1002, 105–107.

Patent Owner also argues that virtual machine references were cited and considered by the Examiner during the prosecution of the ’005 application that were substantially similar to Gien. Prelim. Resp. 31–35 (citing Ex. 1002, 52–55, 57, 135–138, 141; Ex. 2011, Abstr., Fig. 1B, 1:51–62, 4:11–44; Ex. 2012, 2:57–65; Ex. 2013, 3:61–64).

We agree that McCarthy was before the Office during prosecution of the ’005 patent, and was considered by the Examiner in the context of a double patenting rejection.” We also agree that references similar to Gien were considered. Accordingly, we determine that the first part of the *Advanced Bionics* framework is satisfied.

As to the second prong of the *Advanced Bionics* framework, we look to *Becton, Dickinson* factors (c), (e), and (f) to evaluate “the extent to which the asserted art was evaluated during examination, including whether the prior art was the basis for rejection (factor (c)), “whether petitioner has pointed out sufficiently how the examiner erred in its evaluation of the asserted prior art” (factor (e)), and “the extent to which additional evidence and facts presented in the petition warrant reconsideration of the prior art or arguments” (factor (f)). *Advanced Bionics*, Paper 6 at 9–10 n.10 (citing *Becton, Dickinson*, Paper 8 at 17–18).

As Petitioner argues, there is no record that the Examiner evaluated priority for any claim in the ’005 patent or evaluated the McCarthy application for written description support for any claim. Reply 3. *I.e.*, the

Examiner never treated McCarthy's disclosure as prior art. *Id.* at 4.

Although the Examiner rejected claims over McCarthy for obviousness-type double patenting, that has nothing to do with whether McCarthy provided written description support of the '005 claims or whether McCarthy was prior art to the '005 patent. As Petitioner argues, nonstatutory obviousness-type double patenting compares claims in a later application (here, the '005 application) to claims in a commonly-owned patent (here, the patent that issued from the McCarthy application), but there is no consideration of whether the commonly-owned patent's disclosure is prior art. *Id.* (citing *Ortho Pharm. Corp. v. Smith*, 959 F.2d 936, 943 (Fed. Cir. 1992)). Whether the challenged claims are obvious over issued claims of a prior patent is irrelevant to the priority analysis because written description does not include undisclosed subject matter even if that subject matter is obvious. *Lockwood*, 107 F.3d at 1571–72.

As Patent Owner summarizes, the Examiner allowed the '005 patent to issue over the cited art, which included virtual machine art similar to Gien, after applicants amended the claims to require that the “manager process maintains a list comprising a plurality of priority levels for said at least one application and an indication of a quantity of said plurality of resources needed to meet said at least one level of priority.” Prelim. Resp. 9–10 (citing Ex. 1002, 47–59, 113–115, 181–192). This demonstrates that the prior art status of McCarthy was not considered during prosecution, because McCarthy teaches that precise additional limitation. *See* Section III.E above (*re* requirement 8.d).

Accordingly, we determine that the Office did not consider whether the claims of the '005 patent were entitled to the filing date of the McCarthy

application, and therefore McCarthy was not considered as prior art to the '005 patent — or, if it was considered and rejected as prior art without any record of such, that was error material to the patentability of challenged claims. Reply 4–5. As such, we do not find that the Petition, as a whole, sufficiently implicates Section 325(d) such that the institution of *inter partes* review of the challenged claims would undermine the purpose of Section 325(d). Based on the totality of evidence before us, we decline to exercise discretion under Section 325(d) not to institute *inter partes* review.

V. CONCLUSION

After considering the evidence and arguments presented in the Petition and the Preliminary Response, Petitioner has established a reasonable likelihood of prevailing on its assertion that at least one claim of the '005 patent is unpatentable. Accordingly, we institute an *inter partes* review on all the challenged claims and all of the grounds presented in the Petition. At this stage of the proceeding, we have not made a final determination as to the patentability of these challenged claims.

VI. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that pursuant to 35 U.S.C. § 314, *inter partes* review is instituted as to the challenged claims of the '005 patent with respect to all grounds of unpatentability presented in the Petition; and

FURTHER ORDERED that *inter partes* review is commenced on the entry date of this Order, and pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial.

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