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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte PETER JOSEPH HEYRMAN, BRET RONALD OLSZEWSKI, and SERGIO REYES

Appeal 2018-006414
Application 14/306,640
Technology Center 2100

Before LARRY J. HUME, JUSTIN BUSCH, and STEVEN M. AMUNDSON, *Administrative Patent Judges*.

BUSCH, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from the Examiner's decision to reject claims 8, 12–15, 19, and 20, which constitute all the claims pending in this Application. We have jurisdiction over the pending claims under 35 U.S.C. § 6(b).

We AFFIRM.

[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as International Business Machines Corporation. Appeal Br. 2.

CLAIMED SUBJECT MATTER

Appellant's disclosure generally relates to a "technique for assigning physical resources of a data processing system to a virtual machine (VM)" by reading a fold factor attribute, which "defines an anticipated usage of physical resources" by the VM and mapping virtual processors of the VM to physical resources "to maximize processor core access to local memory for ones of the allocated virtual processors that are anticipated to be utilized." Spec. Abstract. The claimed invention relates to reading, in response to a VM being instantiated, a fold factor attribute that defines the VM's anticipated usage of physical resources and mapping allocated virtual processors of the VM to physical resources based on that attribute to maximize processor core access to local memory for allocated virtual processors anticipated to be utilized. *See* Appeal Br. 16 (claim 8). The claims recite the fold factor attribute includes a processor fold factor attribute (defining a percentage of a VM's allocated virtual processors anticipated to be used) and a memory fold factor attribute (defining a percentage of required VM memory anticipated to be used). Claims 8 and 15 are independent claim. Claim 8 is reproduced below:

> 8. A computer program product, comprising:
> a computer-readable storage medium; and
> program code embodied on the computer-readable storage medium, wherein the program code, when executed on a processor, configures the processor to:
> in response to a virtual machine (VM) being instantiated, read a fold factor attribute for the VM, wherein the fold factor attribute defines a user specified anticipated usage of physical resources of a data processing system by the VM; and
> map, based on a value of the fold factor attribute, allocated virtual processors of the VM to the physical resources such that processor core access to local memory that is not located within

> an associated processor is maximized for ones of the allocated virtual processors that are anticipated to be utilized, wherein the fold factor attribute includes a processor fold factor attribute that defines a percentage of the allocated virtual processors of the VM that are anticipated to be utilized and a memory fold factor attribute that defines a percentage of required memory of the VM that is anticipated to be utilized.

REJECTIONS

Claims 8, 12–15, 19, and 20 stand provisionally rejected on the ground of nonstatutory obviousness-type double patenting. Final Act. 3–7.

Claims 8, 12–15, 19, and 20 stand rejected under 35 U.S.C. § 103 as obvious in view of Floyd (US 2012/0096293 A1; Apr. 19, 2012), Smith (US 2004/0117519 A1; June 17, 2004), and Behera (US 8,738,333 B1; May 27, 2014). Final Act. 8–15.

ANALYSIS

THE DOUBLE-PATENTING REJECTION

Appellant does not address the Examiner's provisional rejection of claims 8, 12–15, 19, and 20 under the doctrine of obviousness-type double patenting. *See generally* Appeal Br. 2–15 (addressing only the rejection of claims 8, 12–15, 19, and 20 under 35 U.S.C. § 103); Reply Br. 2–4. Appellant has not filed a terminal disclaimer, nor has the Examiner withdrawn the provisional rejection. In provisionally rejecting claims 8, 12–15, 19, and 20, the Examiner relies on claims 1 and 5–7 of U.S. Application No. 14/491,391.[2]

[2] Co-pending related Application Serial No. 14/491,391 is also on appeal (Appeal No. 2018-006454).

To the extent Appellant has not advanced separate, substantive arguments for particular claims or issues, such arguments are considered waived. *See* 37 C.F.R. § 41.37(c)(1)(iv) (2016); *see also Hyatt v. Dudas*, 551 F.3d 1307, 1314 (Fed. Cir. 2008) ("When the appellant fails to contest a ground of rejection to the Board, . . . the Board may treat any argument with respect to that ground of rejection as waived."). Because Appellant does not argue the merits of this rejection, we summarily sustain the Examiner's provisional rejection of claims 8, 12–15, 19, and 20 under the doctrine of nonstatutory obviousness-type double patenting.

THE 35 U.S.C. § 103 REJECTION

The Examiner finds the combination of Floyd, Smith, and Behera teaches or suggests every limitation recited in independent claim 8. Final Act. 8–13. The Examiner finds Floyd teaches or suggests the majority of limitations recited in independent claim 8, including: in response to a VM being instantiated, Final Act. 8–9 (citing Floyd ¶¶ 28, 36–37); read a fold factor attribute, which defines usage of physical resources, for the VM, Final Act. 9 (citing Floyd ¶¶ 17–18, 44, 57–68, 70); map the VM's virtual processors to physical resources based on a fold factor attribute value, Final Act. 10 (citing Floyd ¶¶ 18, 78); and that the fold factor attribute includes processor and memory fold factor attributes, Final Act. 10–11 (citing Floyd ¶¶ 74, 77). The Examiner finds that, although Floyd teaches folding to optimize local memory, Floyd fails to specifically teach maximizing processor core access to local memory; however, the Examiner finds Smith cures this deficiency. Final Act. 11–12 (citing Smith ¶ 66). The Examiner further finds that, although Floyd and Smith fail to teach the fold factor attribute defines a user-specified anticipated percentage usage of physical

resources, Behera teaches these recited aspects of claim 8. Final Act. 12–13 (citing Behera 2:63–3:3, 3:46–51, 5:46–6:12, 9:13–29, 10:42–45, 14:43–48, Figs. 6, 28).

Appellant argues the rejection of claims 8, 12–15, 19, and 20 as a group. Appeal Br. 3, 14 ("For at least the reasons set forth above, independent claims 8 and 15 are patentable over the combination of Floyd, Smith, and Behera. Additionally, claims 12-14, 19, and 20 are allowable for at least the reason that the claims depend upon allowable claims."). We select independent claim 8 as representative. *See* 37 C.F.R. § 41.37(c)(1)(iv).

In particular, Appellant argues Floyd teaches folding (i.e., unmapping) resources based on the folding desirability metric (FDM), but folding or not folding does not teach or suggest mapping a VM's allocated virtual processors to physical resources based on a fold factor attribute and "Floyd is devoid of any teaching directed to specifically how virtual processors of a VM are mapped to physical resources of a data processing system." Appeal Br. 12–13; *see* Reply Br. 2. Appellant further contends that, to the extent Floyd teaches unfolding resources based on Floyd's FDM, the FDM is based on current conditions associated with each resource, not a processor fold factor attribute defining a percentage of virtual processors anticipated to be used and a memory fold factor attribute defining a percentage of required memory anticipated to be used. Reply Br. 2. Appellant also argues that, to the extent Floyd teaches reallocating folded resources, Floyd fails to teach reallocating resources based on a fold factor attribute read in response to a VM being instantiated. Reply Br. 2.

We disagree with Appellant that Floyd lacks any teaching regarding assigned virtual processors to physical resources, teaches only folding

resources based on the FDM, and fails to teach reallocating resources based on the FDM. Instead, we agree with the Examiner that Floyd explicitly discloses allocating resources based on the FDM. Floyd ¶¶ 18 (explaining that Floyd's "hypervisor manages a dynamic mapping between virtual processors and physical processors" and "released processor resources may subsequently be 'unfolded' or reclaimed"), 73 (disclosing "it is also possible . . . to use the FDM measure . . . to decide which ones of resources 312 to use for any scheduling," by unfolding (i.e., reallocating) folded resources when the FDM surpasses a given threshold).

We also disagree with Appellant's contention that Floyd fails to teach its FDM is based on processor and memory fold factor attributes respectively defining a percentage of virtual processors anticipated to be used and required memory anticipated to be used. Rather, we agree with the Examiner that Floyd's FDM includes processor and memory fold factor attributes because Floyd explicitly discloses its FDM "value is computed from the conditions associated with each" resource, where the resources include processors and memory and the exemplary conditions at least suggest processor and memory fold factory attributes. Floyd ¶ 70; *see* Floyd ¶¶ 57–68 (describing exemplary resource usage properties and conditions), 69 (explicitly identifying "processor cores" as an exemplary resource entity), 74 (describing "virtual processor, physical memory" as exemplary resource types). Appellant's argument that Floyd fails to teach the details regarding percentages of resources anticipated to be used is unpersuasive because the Examiner finds Behera, not Floyd, teaches the memory fold factor attribute defines a percentage of required memory anticipated to be used and the processor fold factor attribute defines a

percentage of allocated virtual processors anticipated to be used. *See* Final Act. 12–13.

Next, we address Appellant's argument that Floyd fails to teach or suggest reading the FDM in response to a VM being instantiated. As noted above, the Examiner finds Floyd teaches or suggests "in response to a virtual machine (VM) being instantiated, read a fold factor attribute." The Examiner breaks this limitation into two parts and cites paragraphs 28, 36, and 37 as teaching "in response to a virtual machine (VM) being instantiated." Final Act. 8–9. Paragraph 18 describes operating system (OS) storage and startup and explains that an OS, among other things, controls program execution and allocates resources. Floyd ¶ 18. Paragraphs 36 and 37 describe logical partitions, including instantiation of logical partitions. Floyd ¶¶ 36–37. Floyd explains that, when logical partitions are instantiated, a virtual machine monitor loads "a copy of the boot strap code" into the logical partitions and transfers control to the boot strap code, the boot strap code loads necessary firmware and software, and then "processors associated or assigned to logical partitions" are "dispatched to the logical partition's memory to execute the logical partition firmware." Floyd ¶ 37.

The Examiner finds paragraphs 17, 18, 44, 57 through 68, and 70 teach or suggest the "read a fold factor attribute" step. Final Act. 9. Paragraphs 17 and 44 describe the concept of folding resources to free up resources so the resources can be used for other tasks, assigned to other resource pools, or placed in an idle mode to reduce power consumption. Floyd ¶¶ 17, 44. Paragraph 18 provides an example in which the system may fold a virtual processor when the aggregate load on a partition is low so the physical processor corresponding to the freed virtual processor can be placed

in an idle mode or used for other partitions, but the system may reclaim the processor resources when the partition's load increases. Floyd ¶ 18. Paragraph 70 explains that the system may use "the conditions associated with each" resource to compute a "Folding Desirability Metric (FDM)" value for each resource that may be used to determine the correct resources to fold or unfold. Floyd ¶ 70. Paragraphs 57 through 68 describe various exemplary resource usage properties or conditions that may be used to compute the FDM. Floyd ¶¶ 57–68.

The Examiner's findings, however, are insufficient to demonstrate that Floyd teaches or suggests the recited limitation of "*in response to* a virtual machine (VM) being *instantiated*, *read* a fold factor attribute for the VM" because the Examiner fails to explain how Floyd's cited passages teach or suggest the FDM is read *in response to* a VM being instantiated. Rather, the Examiner merely points to Floyd's separate disclosures regarding instantiating a partition, which the Examiner presumably finds teach the recited VM, and *computing* the FDM. *See Am. Calcar, Inc. v. Am. Honda Motor Co.*, 651 F.3d 1318, 1340 (Fed. Cir. 2011) ("'In response to' connotes that the second event occur in reaction to the first event."). The Examiner provides insufficient findings and explanation to demonstrate Floyd explicitly teaches the FDM is read in response to instantiating a VM. Furthermore, the Examiner provides insufficient evidence or explanation demonstrating that an ordinarily skilled artisan would have understood the cited passages require or at least suggest storing the FDM and reading the FDM when instantiating a VM in order to allocate resources to the VM.

On this record, for the reasons discussed above, we are constrained to reverse the § 103 rejection of representative independent claim 8. For the

same reasons, we cannot sustain the rejection of independent claim 15, which recites commensurate limitations, or dependent claims 12–14, 19, and 20, which ultimately depend from and inherit the limitations of one of claims 8 and 15.

CONCLUSION

In summary:

Claims Rejected	Basis	Affirmed	Reversed
8, 12–15, 19, 20	Provisional Obviousness-Type Double Patenting	8, 12–15, 19, 20	
8, 12–15, 19, 20	§ 103 Floyd, Smith, Behera		8, 12–15, 19, 20
Overall Outcome		8, 12–15, 19, 20	

AFFIRMED