UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MERCEDES-BENZ USA, LLC, Petitioner,

v.

DAEDALUS PRIME LLC, Patent Owner.

> IPR2023-01343 Patent 8,898,494 B2

Before SCOTT R. BOALICK, *Chief Administrative Patent Judge*, JACQUELINE W. BONILLA, *Deputy Chief Administrative Patent Judge*, and MICHAEL P. TIERNEY, *Vice Chief Administrative Patent Judge*.

TIERNEY, Vice Chief Administrative Patent Judge.

DECISION Delegated Director Review of Final Written Decision 37 C.F.R. § 42.75

I. INTRODUCTION

The Board, in a Final Written Decision, found that Mercedes-Benz USA, LLC ("Petitioner") had not met its burden to demonstrate that the challenged claims are unpatentable. Petitioner filed a timely request for rehearing by the Acting Director. Thereafter, the Acting Director delegated Director Review to a Delegated Review Panel ("DRP") to determine whether the Board:

- (1) misapprehended or overlooked Petitioner's claim construction arguments for the claim term "workload" (Petitioner's Reply 9–11) and erred in construing the term; and
- (2) misapprehended or overlooked White's¹ disclosure in finding that White does not teach "a core workload monitor configured to determine a core workload for the first core" and "receiving a bus workload for a communication bus and a first processing element workload for a first processing element," as claims 1 and 4 respectively require.

Paper 24 ("DRP Delegation Order"), 2.

We conclude that the Board overlooked Petitioner's reliance on a passage in the challenged patent that broadly describes "workload." We modify the Board's construction of "workload" to account for that description.

As to the second issue in the DRP Delegation Order, we remand for the Board to consider the parties' arguments and evidence regarding White's disclosure in view of the modified claim construction. Although it appears

¹ U.S. Patent No. 7,263,457 B2 (Ex. 1006).

that the Board did not misapprehend or overlook White's disclosure in determining that Petitioner failed to persuasively show that White teaches the "workload" limitations, we remand out of an abundance of caution in light of the modified claim construction. We leave it for the Board to determine the conduct of the proceedings on remand, including whether any additional briefing is warranted.

Therefore, we resolve the first issue and remand as to the second issue presented in the DRP Delegation Order.

A. BACKGROUND

Petitioner filed a petition requesting *inter partes* review of claims 1–7, 13–15, 17, and 18 ("the challenged claims") of U.S. Patent No. 8,898,494 B2 (Ex. 1001, the "'494 patent"). Paper 2 ("Petition" or "Pet."), 1. On February 13, 2024, the Board instituted *inter partes* review as to all challenged claims and all asserted grounds of unpatentability. Paper 7. Following institution, Daedalus Prime LLC ("Patent Owner") filed a Response (Paper 10, "PO Resp."), Petitioner filed a Reply (Paper 13, "Pet. Reply"), and Patent Owner filed a Sur-reply (Paper 14, "PO Sur-reply").

On January 8, 2025, the Board issued a Final Written Decision, determining that Petitioner had not proven by a preponderance of the evidence that the challenged claims of the '494 patent were unpatentable. Paper 21 ("Final Written Decision" or "FWD"), 33–34.

On February 7, 2025, Petitioner filed a Request for Director Review of the Final Written Decision. Paper 22 ("DR Req."). On February 14, 2025, Patent Owner filed a Response to the Request for Director Review. Paper 23 ("DR Resp.").

On March 25, 2025, the Acting Director delegated review to a Delegated Rehearing Panel ("DRP") and instructed the DRP to determine two issues (discussed in Section I.G. below).

B. The '494 Patent

The '494 patent, titled "Power Budgeting Between a Processing Core, a Graphics Core, and a Bus on an Integrated Circuit When a Limit is Reached," describes a method and system for "efficiently balancing performance and power between processing elements based on measured workloads." Ex. 1001, codes (54), (57). The two independent claims at issue here, claims 1 and 4, each recite the term "workload" in relation to a processor and a storage medium, respectively. *Id.* at 21:17–39, 21:60–22:20.

According to the '494 patent, "[i]f a workload of a processing element indicates that it is a bottleneck, then its performance may be increased"; however, if the processing element "is already operating at a power or thermal limit, the increase in performance is counterbalanced by a reduction or cap in another processing [element's] performance to maintain compliance with the power or thermal limit." *Id.* at code (57). The '494 patent explains that "a device that is determined to be a bottleneck for performance, such as throughput performance as viewed from the perspective of an application, is allocated more current/frequency, while the other competing device is capped/limited to ensure the power limit is still met." *Id.* at 7:51–56.

The '494 patent explains this balancing of performance with reference Figure 1, below:



FIG. 1

Figure 1 above illustrates an integrated circuit package 100 having two processing cores 101 and 102 and graphics processor 180. *Id.* at 1:64– 67, 4:10–11, 7:62–63. According to the '494 patent specification, central processing unit ("CPU") cores 101 and 102 receive and process instructions, some of which are offloaded to graphics processor 180 for processing. *Id.* at 7:65–8:2. The '494 patent explains that if cores 101 and 102 are overworking, then overall performance is degraded because the extra performance that the cores 101 and 102 are utilizing to overproduce could have been allocated to graphics processor 180. *Id.* at 8:2–7. Thus, the patent describes the following balancing to maximize overall performance:

[I]n one embodiment, processing workload of cores 101-102 and graphics workload of graphics device 180 are determined. For example, *an amount of activity (e.g., number of cycles active) over a quantum or period of time* is determined for both cores 101-102 and graphics core 180. And *based on these workloads*, performance of cores 101-102 and graphics core 180 are balanced to achieve maximum overall performance.

Id. at 8:18–25 (emphases added).

The '494 patent further explains that "[d]etermining a *workload* includes any known method for determining *activity* of hardware, a workload of software, a *number of instructions* executed or to execute, or *any other metric for determining use of a processing element.*" *Id.* at 9:49–52 (emphases added); *see also id.* at 16:19–23 (same). According to the patent, "[a]s one example, a workload for core 505 [shown in Figure 5] includes an amount of time core 505 is active during a period of time." *Id.* at 9:52–54. The patent states that "[a]ctivity may be determined as when core 505 is in an active performance state versus a sleep or low power state or a number of cycles executing or performing operations." *Id.* at 9:54–57.

The '494 patent further describes that "[a]s a corollary to the multitude of potential workload measurements, the components to measure such workload may also vary." *Id.* at 9:58–60. The patent provides three examples of different hardware/software for tracking active cycles for a period of time based on the assumption that "workload is measured as a

number of active cycles over a period of time (i.e., a total number of cycles for measurement)." *Id.* at 9:60–10:5.

C. WHITE

White is a U.S. patent titled "System and Method for Operating Components of an Integrated Circuit at Independent Frequencies and/or Voltages." Ex. 1006, code (54). Figure 2A of White, below, illustrates an embodiment of a multi-core integrated circuit in which the operating voltages and/or frequencies are controlled by power management logic (*id.* at 5:32–35):



FIG. 2A

White discloses that, in Figure 2A above, "power management logic 200 may be configured to control the operating characteristics, such as the operating voltage and/or operating frequency, of each of multiple logic cores 120 of integrated circuit 100." *Id.* at 8:62–65. White discloses adjusting the operating characteristics "in order to adjust the overall power consumption

for integrated circuit 100," such as when the system is operating or not operating on battery power. *Id.* at 9:1-12.

According to White, "power management logic 200[] may determine that logic core 120A is consuming power in excess of that allocated to it for a particular mode of system operation. In response to this determination, the power management logic 200 may issue a request to the logic core 120A to alter its frequency of operation." *Id.* at 9:56–62. White discloses that power management logic 200 may be "part of a single set of logic, implemented in hardware, firmware, software, or a combination thereof, that is configured to monitor and adjust the operating frequency and/or voltage of various portions of integrated circuit 100, such as the logic cores 120 and common bridge logic 110." *Id.* at 14:32–38.

D. PETITIONER'S WHITE-BASED GROUNDS

1. Petitioner's Assertions

Petitioner relies on White alone or in combination with one or more additional references in asserting that the challenged claims of the '494 patent are unpatentable. Pet. 6–7. As germane to the issues raised in the DRP Delegation Order, Petitioner relies on White for teaching "receiving a bus workload for a communication bus and a first processing element workload for a first processing element" of independent claim 4 and for teaching "a core workload monitor configured to determine a core workload for the first core" of independent claim 1. *Id.* at 51–54, 72–73.

With respect to claim 4, Petitioner asserts that White discloses power management logic that "receives workloads for common bridge logic 110 and logic core 120A, such as their operating voltages and frequencies." *Id.*

at 53. Petitioner asserts that White's power management logic 200 determines output voltage levels and receives operating frequencies for logic cores and common bridge logic 110. *Id.* Relying on the declaration of David Wyatt (Ex. 1003, "Wyatt Decl."), Petitioner asserts that a person of ordinary skill in the art "would have understood that operating voltage/frequency reflect the activity and use, or workload, of a component." *Id.* (citing Ex. 1003 ¶ 103). In the cited paragraph from Mr. Wyatt's declaration, he states that "[i]t was well understood that operating frequency and voltage of a component reflect the activity and use, or workload, of that component." Ex. 1003 ¶ 103.

With respect to claim 1, Petitioner refers to its analysis of claim 4 in stating that, "[a]s discussed above, White discloses power management logic 200 monitors and determines the operating voltages and frequencies of components such as the logic cores and common bridge logic 110." Pet. 72. Again relying on Mr. Wyatt's declaration, Petitioner asserts that a person of ordinary skill in the art "would have understood White monitoring the operating voltages and frequencies of the logic core 120A and common logic bridge 110 is monitoring the workload of those components." *Id.* (citing Ex. 1003 ¶ 134). Petitioner thus asserts that "the power management logic 200 is a core workload monitor that determines a core workload for a first core." *Id.*

Petitioner does not propose a specific construction for the term "workload" in the Petition. *See* Pet. 12. In its Reply, Petitioner asserts that "nothing in the '494 Patent indicates that determining a 'workload' cannot be done by monitoring operating frequencies and voltages, which provide *indications of activity or use* of a processing element." Pet. Reply 10

(emphasis added). For support, Petitioner quotes the passage in the '494 patent that determining a workload includes "any other metric for determining use of a processing element." *Id.* (quoting Ex. 1001, 9:47–57) (emphasis omitted). Petitioner also relies on the '494 patent's statement that "if workload module 520 determines the [graphics processing unit (GPU)] 505's frequency is below a threshold..., then any CPU 505's frequency cap or limit is increased to cause more production, such that GPU cores 510 workload increases accordingly." *Id.* (quoting Ex. 1001, 10:65–11:2) (emphasis omitted). Relying again on Mr. Wyatt's declaration submitted with the Petition, Petitioner asserts that "it is well understood by a [person of ordinary skill in the art] that the operating frequency and voltage of a component reflect the activity and use, or workload, of that component." *Id.* at 11 (citing Ex. 1003 ¶ 103).

2. Patent Owner's Assertions

Patent Owner asserts that a person of ordinary skill in the art would have understood that the term "workload" means "an amount of activity over a quantum or period of time." PO Resp. 15. Patent Owner also asserts that Petitioner's declarant, Mr. Wyatt, acknowledged at his deposition that "workload" would have been understood as activity over time. *Id.* at 15–16 (citing Ex. 2002, 34:14–36:9).

With respect to measuring a workload, Patent Owner relies on its declarant, Dr. Michael Brogioli, and asserts that monitoring operating voltages and frequencies is not monitoring workload because "performance metrics such as frequency can be altered independently of workload." *Id.* at 44 (citing Ex. 2001 \P 66).

Patent Owner provides further explanation in its Sur-reply for why frequency is different from workload. *See* PO Sur-reply 1–2, 6–7. Patent Owner first notes that Dr. Brogioli's testimony that "performance metrics such as frequency can be altered independently of workload" is unrebutted. *Id.* at 7. Patent Owner also points to the disclosure in the '494 patent that "if a power limit is reached, then GPU 605's performance metric, such as frequency, may be reduced, since it doesn't need full performance to complete its workload that was below an activity threshold." *Id.* (quoting Ex. 1001, 12:61–65). Patent Owner asserts that this statement shows that workload and frequency are not synonymous because the statement "makes clear that a component running at 'full performance,' i.e., maximum frequency, may still have a workload below a threshold." *Id.* at 1–2; *see also id.* at 7 (the statement "is an indication that a GPU that was running at 'full performance,' i.e., maximum frequency, may have been overworking since its workload was below an activity threshold, i.e., not a maximum.").

E. THE PANEL'S FINAL WRITTEN DECISION

In its Final Written Decision, the Board panel determined that Dr. Brogioli's declaration testimony, Mr. Wyatt's deposition testimony, and the '494 patent specification support Patent Owner's proposal that "workload" means "an amount of activity over a quantum or period of time." FWD at 15 (citing Ex. 2001 (Brogioli Decl.) ¶¶ 36–38; Ex. 2002 (Wyatt Dep. Tr.), 34:14–36:9; Ex. 1001, 8:20–22, 9:60–63). The panel also stated that Petitioner does not dispute this proposed construction in its Reply. *Id*. The panel therefore adopted Patent Owner's proposed construction for "workload." *Id*.

The Board panel also agreed with Patent Owner that "there is a distinction between White's operating voltages and frequencies and the claimed workload." *Id.* at 28. The panel found that "the current voltages and frequencies received by the power management logic in White are operating conditions that do not reflect the 'amount of activity over a period of time." *Id.* The panel stated that it agreed with Dr. Brogioli's testimony that "[t]he workload is a function of the demands imposed by, e.g., applications running on the system, and may or may not be subject to direct control, whereas the conditions under which that workload is processed are controlled directly." *Id.* at 30–31 (quoting Ex. 2001 (Brogioli Decl.)¶66).

The panel also found "the testimony of Mr. Wyatt on this issue unconvincing." *Id.* at 31. The panel noted that Mr. Wyatt did not provide any evidentiary support for his statement that "[i]t was well understood that operating frequency and voltage of a component reflect the activity and use, or workload, of that component" and therefore gave it little weight. *Id.* (citing Ex. 1003 (Wyatt Decl.)¶103).

The Board panel thus determined that White does not teach or suggest "a core workload monitor configured to determine a core workload for the first core," as recited in '494 patent claim 1, or "receiving a bus workload for a communication bus and a first processing element workload for a first processing element," as recited in '494 patent claim 4. *Id.* at 27–33. For these reasons, the panel concluded that Petitioner had not demonstrated that the challenged claims of the '494 patent are unpatentable based on the grounds relying on White. *Id.* at 33.

F. PETITIONER'S DIRECTOR REVIEW REQUEST AND PATENT OWNER'S RESPONSE

Requesting Director Review of the panel's Final Written Decision, Petitioner asserts that "the Board erred by improperly construing 'workload' as 'amount of activity over a period of time,' in contradiction to express disclosures in the '494 Patent, and then misinterpreting White... in view of this unduly narrow construction." DR Req. 1.

As to the construction of "workload," Petitioner asserts that the '494 patent "confirms workload is not limited to a measurement of amounts of activity over time, but can be reflected by any measurement or metric *related to the 'use'* of a component." *Id.* at 9 (emphasis added). Petitioner also asserts that the '494 patent "indicates that frequency can be monitored as an indication of use or 'workload' of a component." *Id.* at 10. Petitioner also maintains that it disputed the proposed construction in its Reply, notwithstanding the panel's statement to the contrary. *Id.* at 11.

As to whether White teaches the disputed workload claim limitations, Petitioner asserts that "while frequency and voltage may not expressly be 'an amount of activity over a quantum or period of time,' they nonetheless reflect a metric of the 'use' of a component." *Id.* at 12. Thus, according to Petitioner, "White's disclosure of monitoring frequency and voltage meet the '494 Patent's express definition of what constitutes a determination of 'workload." *Id.* at 13.

In response to Petitioner's Director Review Request, Patent Owner maintains that the Board correctly determined that White does not teach monitoring and receiving a workload. DR Resp. 4–5. Patent Owner asserts that Petitioner's discussion about how a workload might be determined,

rather than what a workload is, is not germane to the claim construction issue and was fully considered by the Board panel. *Id.* Patent Owner further asserts that Dr. Brogioli's testimony regarding White's frequency and voltage monitoring is ample support for the Board's decision, whereas, in contrast, Petitioner's declarant, Mr. Wyatt, does not provide any evidentiary support for his testimony. *Id.* at 5.

G. THE ACTING DIRECTOR'S DELEGATION ORDER

As noted above, the Acting Director determined that the panel's Final Written Decision warrants review by a Delegated Rehearing Panel ("DRP"). Specifically, the Acting Director delegated review to a DRP to determine whether the Board:

(1) misapprehended or overlooked Petitioner's claim construction arguments for the claim term "workload" (Petitioner's Reply 9–11) and erred in construing the term, and

(2) misapprehended or overlooked White's^[] disclosure in finding that White does not teach "a core workload monitor configured to determine a core workload for the first core" and "receiving a bus workload for a communication bus and a first processing element workload for a first processing element," as claims 1 and 4 respectively require.

DRP Delegation Order 2.

II. ANALYSIS

A. THE BOARD'S CONSTRUCTION OF "WORKLOAD" SHOULD BE MODIFIED SUCH THAT WORKLOAD MEANS "AN AMOUNT OF ACTIVITY OR USE OVER A QUANTUM OR PERIOD OF TIME."

As to the first issue in the DRP Delegation Order, as discussed in more detail below, we conclude that the Board overlooked Petitioner's claim construction arguments in its reply brief (Pet. Reply 10) and, more

specifically, Petitioner's reliance on a description in the '494 patent that determining "workload" also includes determining "use" of a processing element. We also conclude that, when properly construed, the term "workload" means "an amount of activity *or use* over a quantum period of time." Thus, we modify the original Board panel's claim construction of the term "workload" to include "or use" after "activity" in the original Board panel's construction.

The '494 patent does not explicitly define the term "workload" but provides several examples of measuring a workload. One key passage of the patent, which is the source of Patent Owner's proposed construction, as adopted by Patent Owner's declarant, is the following:

[I]n one embodiment, processing *workload* of cores 101-102 and graphics *workload* of graphics device 180 are determined. For example, *an amount of activity (e.g., number of cycles active) over a quantum or period of time* is determined for both cores 101-102 and graphics core 180. And *based on these workloads*, performance of cores 101-102 and graphics core 180 are balanced to achieve maximum overall performance.

Ex. 1001, 8:18–25 (emphases added). In this example, workload is the amount of activity (e.g., amount of active cycles) over a quantum or period of time.

Another key passage of the '494 patent, on which Petitioner relies (Pet. Reply 10), is the following:

Determining a workload includes any known method for determining activity of hardware, a workload of software, a number of instructions executed or to execute, or any other metric for determining use of a processing element. As one example, a workload for core 505 includes an amount of time core 505 is active during a period of time. Activity may be determined as when core 505 is in an active performance state

versus a sleep or low power state or a number of cycles executing or performing operations.

'494 patent at 9:49–57 (emphases added). The above passage broadly describes workload as including activity of hardware, number of instructions, or *use of a processing element*. *Id*. This broad description is repeated later in the patent. *Id*. at 16:19–23; *see also* Pet. Reply 10.

In the above passage and throughout the patent, when providing specific examples of measuring workload, the '494 patent provides details for measuring activity or number of active cycles over a period of time. Id. at 9:60–10:5, 16:23–56. For instance, the patent describes an example where "a number of cycles GPU cores 605 are active is held in a register, counter, and/or accumulator in GPU 605" and the count is loaded every period to determine GPU activity. Id. at 12:3-6; see also id. at 13:31-36 (describing reading an activity count over a period of time). The patent also equates workload and activity in several examples. Id. at 10:60-62 ("[I]f GPU cores 510 are operating over a workload/activity threshold, it's considered a bottleneck."), 13:35-36 ("Yet, any known method of tracking workload or activity over a period of time may be utilized."), 13:60-62 ("[I]n flow 725 it's determined if the loaded GPU workload is greater than a workload/activity threshold."). Further, with respect to an example involving a communication bus, the '494 patent describes determining activity in terms of "number of cycles or number of work slots occupied by activity" on the bus. Id. at 16:32-34. This activity is determined over a period of time. Id. at 16:34-41.

Although the '494 patent provides several examples of measuring activity over a period of time, the patent does not provide any example of

what would constitute measuring "use" rather than "activity" of a component. *See, e.g., id.* at 9:47–63, 16:19–47.

In its Petition, Petitioner did not propose an express construction of "workload." *See* Pet. 12. In its Response, Patent Owner asserted that a person of ordinary skill in the art would have understood "workload" to mean "an amount of activity over a quantum of period of time." PO Resp. 15 (citing Ex. 2001 (Brogioli Decl.) ¶¶ 36–38).

In its Reply, although Petitioner did not argue against Patent Owner's proposed construction of the stand-alone term "workload" or offer an alternative construction for "workload," Petitioner asserted that *determining* a workload encompasses any metric for determining use of a processing element, citing the broad description in the '494 patent quoted above. Pet. Reply 10 (citing Ex. 1001, 9:47–57, 16:19–23). Petitioner raised this argument in the context of arguing why, in its view, White teaches the claimed determining a workload. *Id.* at 9–11.

Although the Board considered Petitioner's reply argument that White teaches the claimed "workload" limitations (FWD at 27–31), the panel (FWD at 15) appears to have overlooked Petitioner's arguments in its Reply disputing Patent Owner's construction of the claim term "workload" (Pet. Reply 10–11).

We determine that the '494 patent describes "workload" broadly as encompassing an amount of activity or use over a quantum or period of time. *See, e.g.*, Ex. 1001, 8:18–25, 9:47–52, 16:19–23. Although the specific examples in the patent involve measuring activity (or bus work slots) over a period of time, the '494 patent includes the broad statement that determining a workload includes "any other metric for determining use of a processing

element." *Id.* at 9:49–52. We thus conclude that the Board's construction should be modified to include "or use" after "activity."

To the extent Petitioner asserts that the construction should be even broader to encompass any metric "related to the 'use' of a component," we decline to adopt that construction, the bounds of which are unclear. See DR Req. 9 (asserting "the '494 Patent confirms workload is not limited to a measurement of amounts of activity over time, but rather can be reflected by any measurement or metric *related to* the 'use' of a component") (emphasis added). The broad statement from the '494 patent on which Petitioner relies does not say that determining workload includes any metric "related to" use; rather, the patent says "metric for *determining use*." Ex. 1001, 9:49–52. The '494 patent consistently describes determining specific activity levels, cycles, or slots in the context of a period of time. Id. at 9:47–10:5, 12:1–6, 13:31–36, 16:19–56. To the extent Petitioner relies on the sentence in the '494 patent bridging columns 10 and 11 as support for its proposal of "related to" the use of a component, we disagree. See DR Req. 10. That sentence does not clearly show that workload should be defined to include a metric related to use, whereas other disclosures in the patent clearly describe workload as a measure of activity or use over time. Compare Ex. 1001, 10:65–11:2, with id. at 9:49–10:5, 10:60–62, 13:31–36, 13:60–62, 16:19– 56.

In summary, we determine that the panel overlooked Petitioner's claim construction arguments in its Reply (Pet. Reply 10) that rely on the broad description in the '494 patent indicating that determining "workload" includes determining "use" of a processing element. We also determine,

when properly construed, "workload" means "an amount of activity *or use* over a quantum period of time."

B. REMAND FOR THE BOARD TO CONSIDER THE SECOND ISSUE IN THE DRP DELEGATION ORDER

As to the second issue in the DRP Delegation Order, it appears that the Board panel did not misapprehend or overlook White's disclosure of determining frequency or voltage in finding that White does not teach the disputed workload limitations of '494 patent claims 1 and 4. Nevertheless, because we have modified the construction of "workload," out of an abundance of caution we remand for the Board to consider the second issue of the DRP Delegation Order and determine whether to grant rehearing based on that issue. We leave it for the Board to determine the conduct of the proceedings on remand, including whether any additional briefing is warranted.

III. CONCLUSION

We determine that the Board overlooked Petitioner's reliance, in claim construction arguments in its Reply, on a description in the '494 patent indicating that determining "workload" also includes determining "use" of a processing element. In addition, we determine, when properly construed, "workload" means "an amount of activity *or use* over a quantum period of time."

We remand for the Board to determine whether rehearing of the Final Written Decision is warranted in light of our revised claim construction. Specifically, we remand to determine whether the Board misapprehended or overlooked White's disclosure in finding that White does not teach the

disputed workload limitations of '494 patent claims 1 and 4. See DRP Delegation Order, 2.

IV. ORDER

Accordingly, it is

ORDERED that the case is remanded for consideration of the second issue of the DRP Delegation Order.

For PETITIONER:

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