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Patent Trial and Appeal Board
INFORMATIVE
Standard Operating Procedure 2
Designated: 12/11/19

Paper 34
Entered: August 5, 2019

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HULU, LLC,
Petitioner,

v.

SOUND VIEW INNOVATIONS, LLC,
Patent Owner.

Case IPR2018-00582
Patent 6,502,133 B1

Before DEBRA K. STEPHENS, DANIEL J. GALLIGAN, and JOHN A. HUDALLA, *Administrative Patent Judges*.

HUDALLA, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
Inter Partes Review
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

Petitioner, Hulu, LLC ("Petitioner"), filed a Petition (Paper 3, "Pet.") requesting an *inter partes* review of claims 1, 9–13, and 21 of U.S. Patent No. 6,502,133 B1 (Ex. 1001, "the '133 patent") pursuant to 35 U.S.C. §§ 311–319. Patent Owner, Sound View Innovations, LLC ("Patent Owner"), filed a Preliminary Response (Paper 8, "Prelim. Resp."). Taking into account the arguments presented in Patent Owner's Preliminary

Response, we determined that the information presented in the Petition established that there was a reasonable likelihood that Petitioner would prevail in challenging claims 1, 9–13, and 21 of the '133 patent under 35 U.S.C. § 103(a)[1] on one ground of unpatentability presented. Pursuant to 35 U.S.C. § 314, we instituted this proceeding, as to all challenged claims and all grounds of unpatentability, on August 14, 2018. Paper 11 ("Dec. on Inst.").

During the course of trial, Patent Owner filed a Patent Owner Response (Paper 18, "PO Resp."), and Petitioner filed a Reply to the Patent Owner Response (Paper 21, "Pet. Reply"). Patent Owner also filed a Sur-Reply. Paper 24 ("PO Sur-Reply"). An oral hearing was held on May 9, 2019, and a transcript of the hearing is included in the record. Paper 33 ("Tr.").

Petitioner filed declarations of Phillip B. Gibbons, Ph.D., with its Petition (Ex. 1002) and Reply (Ex. 1017). Patent Owner filed a declaration of Mark T. Jones, Ph.D. (Ex. 2003) with its Response. The parties also filed transcripts of the depositions of Dr. Gibbons (Exs. 2004, 2006) and Dr. Jones (Ex. 1016).

We have jurisdiction under 35 U.S.C. § 6. This Decision is a Final Written Decision under 35 U.S.C. § 318(a) as to the patentability of claims 1, 9–13, and 21 of the '133 patent. For the reasons discussed below,

[1] The Leahy-Smith America Invents Act ("AIA"), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), revised 35 U.S.C. § 103, effective March 16, 2013. Because the application from which the '133 patent issued was filed before this date, the pre-AIA version of § 103 applies.

Petitioner not has demonstrated by a preponderance of the evidence that claims 1, 9–13, and 21 of the ’133 patent are unpatentable.

I. BACKGROUND

A. Related Proceedings

As required by 37 C.F.R. § 42.8(b)(2), the parties identify various district court litigations involving the ’133 patent. Pet. 3; Paper 6, 1–2; Paper 27, 1–2.

B. The ’133 Patent

The ’133 patent relates to “processing real-time events in applications such as telecommunications and computer networks.” Ex. 1001, 1:19–22. Figure 1 of the ’133 patent is reproduced below.

FIG. 1

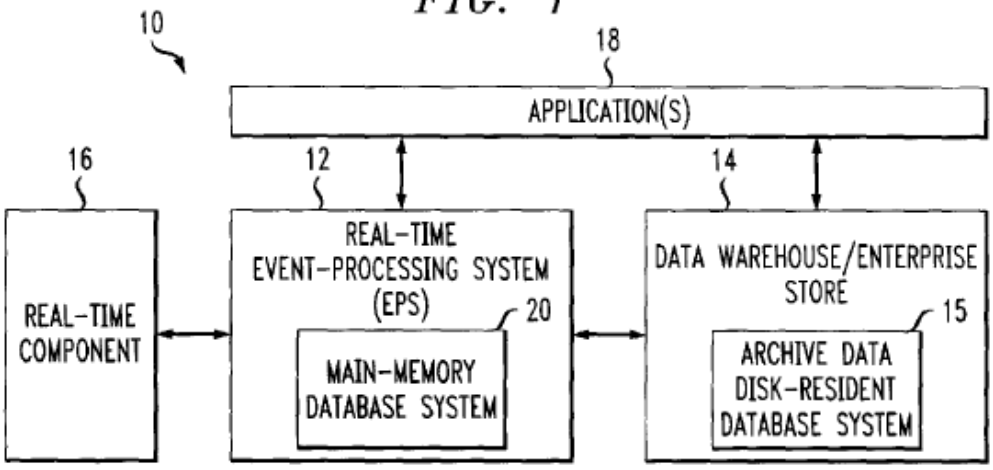


Figure 1 depicts information processing system 10 for real-time event processing. *Id.* at 2:52–53, 3:20–21. Processing system 10 includes real-time event processing system (EPS) 12, data warehouse/enterprise store (DW/ES) 14, real-time component 16, and one or more applications 18. *Id.* at 3:19–25. Real-time EPS 12 includes main-memory database system 20,

which is where data necessary for event processing are stored to meet real-time performance goals. *Id.* at 3:25–28, 3:34–36. Real-time EPS 12 may be implemented in whole or in part using a computer or other type of digital data processor. *Id.* at 4:22–24. Due to space limitations in main-memory database system 20, individual processed event records are typically archived in DW/ES 14, which includes archive data and disk-resident database system 15. *Id.* at 3:23–24, 3:36–39. Applications 18 may be directed to billing, fraud detection/prevention, etc. *Id.* at 3:25–26.

Figure 2 of the ’133 patent is reproduced below.

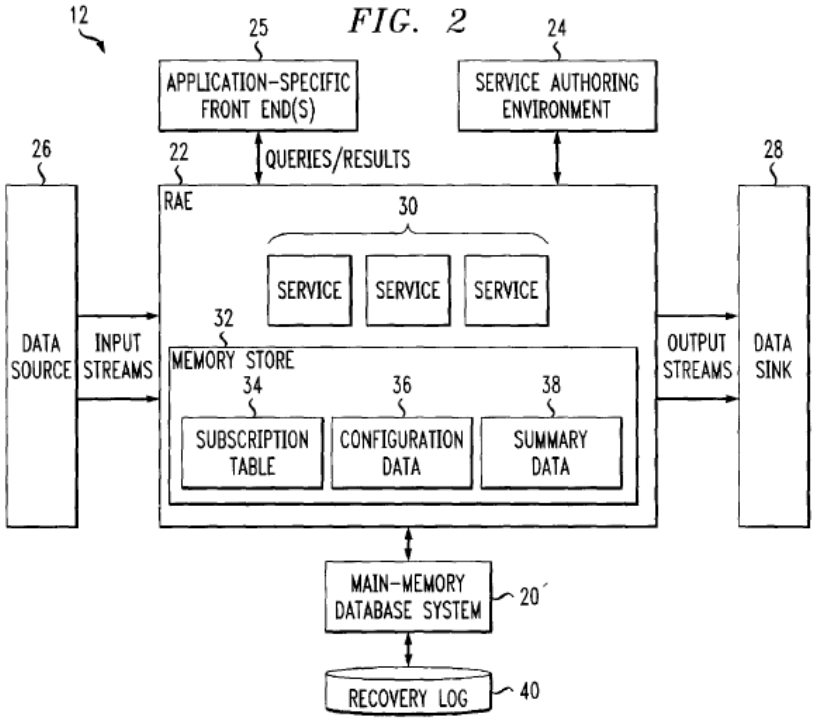


Figure 2 depicts EPS 12, which includes real-time analysis engine (RAE) 22 and service authoring environment (SAE) 24. *Id.* at 4:33–36. RAE 22, which serves as the real-time event processing and aggregation engine of EPS 12, is a single-site database system kernel adapted to meet the needs of high-throughput, real-time systems. *Id.* at 4:40–43. RAE 22 interacts with

application-specific front ends 25 associated with applications 18, receives input streams from data source 26, and delivers output streams to data sink 28. *Id.* at 4:50–53. Data source 26 and data sink 28 may represent a client associated with applications 18. *Id.* at 4:53–56, 4:66–5:2.

C. Illustrative Claim

Of the challenged claims, claims 1, 13, and 21 of the '133 patent are independent. Claims 9–12 depend directly or indirectly from claim 1. Claim 1 is illustrative of the challenged claims and recites:

> 1. An apparatus for processing events generated by at least one system application, the apparatus comprising:
>
> a processor for executing code to implement at least a portion of at least one real-time analysis engine, wherein the real-time analysis engine processes the events, and wherein associated with the real-time analysis engine in a main-memory database system is recovery information regarding a recovery point for the real-time analysis engine.

Id. at 32:23–31.

D. Prior Art

Petitioner relies on the following prior art:

> Svein-Olaf Hvasshovd et al., *The ClustRa Telecom Database: High Availability, High Throughput, and Real-Time Response*, *in* Proc. of the 1st VLDB Conference 469, Zurich, Switzerland (1995) (Ex. 1004, "Hvasshovd");
>
> U.S. Patent No. 6,226,364 B1 to O'Neil, filed Dec. 8, 1997, issued May 1, 2001 (Ex. 1005, "O'Neil");
>
> Ben Kao & Hector Garcia-Molina, *An Overview of Real-Time Database Systems*, *Chapter 19 in* Advances in Real-Time Systems 463 (Sang H. Son ed., Prentice Hall 1995) (Ex. 1006, "Kao"); and

David J. DeWitt et al., *Implementation Techniques for Main-Memory Database Systems, in* Proc. ACM SIGMOD Int'l Conf. on Management of Data, Boston, Mass. (June 1984) (Ex. 1007, "DeWitt").

E. The Instituted Grounds

We instituted *inter partes* review of claims 1, 9–13, and 21 of the '133 patent on the following grounds (Dec. on Inst. 27), which are all of the grounds presented in the Petition (Pet. 6):

References	Basis	Claims Challenged
Hvasshovd, Kao, and DeWitt	35 U.S.C. § 103(a)	1, 9–13, and 21
O'Neil, Kao, and DeWitt	35 U.S.C. § 103(a)	1, 9–13, and 21

F. Level of Ordinary Skill in the Art

Citing testimony from Dr. Gibbons, Petitioner contends a person having ordinary skill in the art would have had "at least a Bachelor's degree in electrical engineering or computer science (or equivalent degree or experience) with at least two years of experience in the design and/or development of database and record management systems" or, alternatively, "less than two years of practical experience but . . . more formal education in computer science, such as a Master's degree." Pet. 5–6 (citing Ex. 1002 ¶¶ 9–11). Patent Owner does not take a position regarding the level of ordinary skill in the art, but Dr. Jones "generally agree[s] with the level of ordinary skill described by [Dr.] Gibbons." Ex. 2003 ¶ 20. We apply Petitioner's definition of the level of ordinary skill in the art. We are satisfied that this definition comports with the level of skill necessary to

understand and implement the teachings of the ’133 patent and the asserted prior art.

G. Claim Interpretation

In our Institution Decision, we granted Patent Owner’s motion for a district court-type claim construction under 37 C.F.R. § 42.100(b) (2017) due to expiration of the ’133 patent within 18 months from entry date of the Notice of Filing Date Accorded to the Petition. Dec. on Inst. 6–7. Accordingly, our interpretation of the claims is similar to that of a district court. *See* 37 C.F.R. § 42.100(b) (2017); *In re Rambus Inc.*, 694 F.3d 42, 46 (Fed. Cir. 2012). Under the standard applied by district courts, claim terms are generally given their plain and ordinary meaning as would be understood by a person of ordinary skill in the art at the time of the invention and in the context of the entire patent disclosure. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc). “There are only two exceptions to this general rule: 1) when a patentee sets out a definition and acts as his own lexicographer, or 2) when the patentee disavows the full scope of a claim term either in the specification or during prosecution.” *Thorner v. Sony Computer Entm’t Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012). We apply the district court standard to the claims of the ’133 patent.

1. Whether the Preambles of the Challenged Claims Are Limiting

In our Institution Decision, we determined that the preambles of the challenged claims are limiting because the preambles provide antecedent basis for certain limitations in the bodies of the claims. Dec. on Inst. 8. The parties do not dispute this determination (*see* PO Resp. 6; Pet. Reply 3), and

we discern no reason to change it. Accordingly, we adopt our analysis from the Decision on Institution and consider the preambles limiting in this Decision. *See* Dec. on Inst. 8.

2. Construction of Claim Terms

We determine that no terms require explicit construction. *See, e.g.*, *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("[W]e need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy' . . . ." (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

II. ANALYSIS

A. Principles of Law

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) where in evidence, so-called secondary considerations.[2] *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

[2] Patent Owner does not put forth any arguments or evidence related to secondary considerations of nonobviousness.

We also recognize that prior art references must be "considered together with the knowledge of one of ordinary skill in the pertinent art." *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994) (citing *In re Samour*, 571 F.2d 559, 562 (CCPA 1978)). We analyze Petitioner's obviousness grounds with the principles identified above in mind.

B. Obviousness Ground Based on O'Neil, Kao, and DeWitt

Petitioner contends the subject matter of claims 1, 9–13, and 21 would have been obvious over O'Neil, Kao, and DeWitt. Pet. 47–63; Pet. Reply 3–16. Patent Owner disputes Petitioner's contentions. PO Resp. 5–34; PO Sur-Reply 4–15.

1. O'Neil

O'Neil is a U.S. patent directed to a method and system for providing prepaid and credit-limited cellular telephone services. Ex. 1005, 1:6–9. Figure 1 of O'Neil is reproduced below.

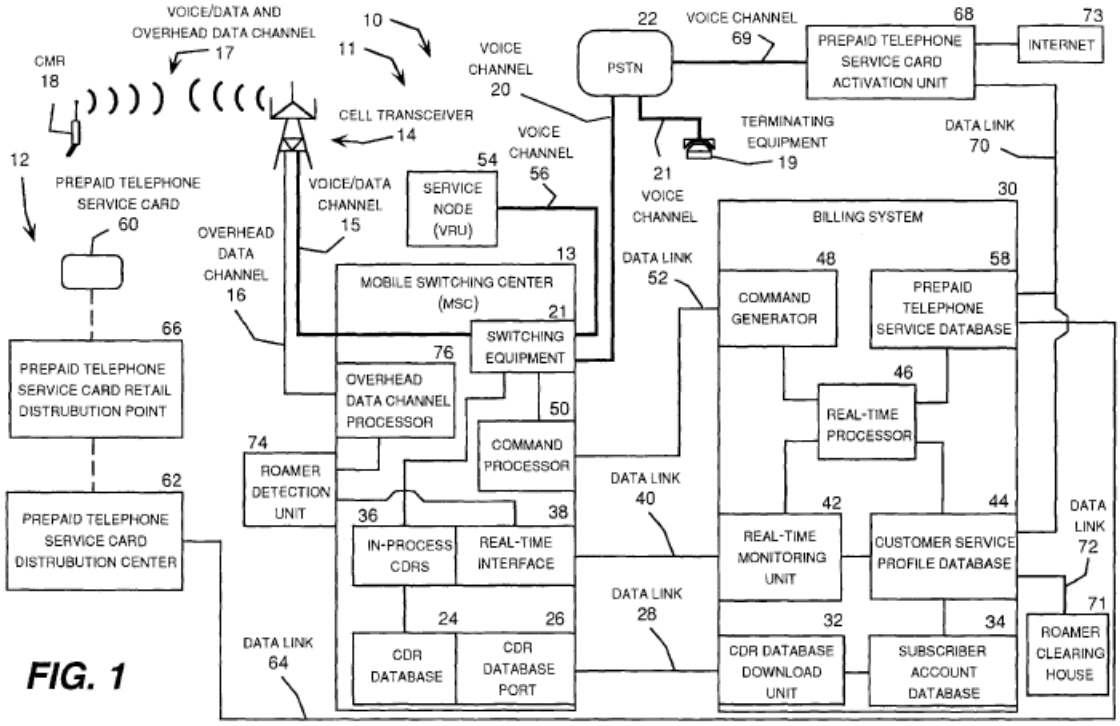


FIG. 1

Figure 1 is a functional block diagram of cellular mobile radiotelephone (CMR) system 10 including real-time telephone call monitoring, rating, and response system 11 with associated prepaid telephone card system 12. *Id.* at 13:18–27. CMR system 10 includes Mobile Switching Center (MSC) 13, which is connected to cell transceiver 14 by way of voice channel link 15 and overhead data channel link 16. *Id.* at 13:33–36. Cell transceiver 14 maintains bidirectional communications 17 with a large number of cellular mobile radiotelephones (CMRs) 18. *Id.* at 13:38–41.

MSC 13 creates a billing record known as a call detail record (CDR) for each telephone call connected through MSC 13. *Id.* at 13:58–60. Specifically, "MSC 13 maintains in-process CDR records 36, which are created and augmented for individual telephone calls while the telephone calls are taking place." *Id.* at 14:29–31. Real-time interface 38 exposes in-process CDRs 36 for monitoring by real-time monitoring unit 42 within

billing system 30 via real-time data link 40. *Id.* at 14:35–40. CDRs also are stored in CDR database 24, which is periodically downloaded through CDR database port 26 and over data link 28 to billing system 30. *Id.* at 13:64–67.

Real-time monitoring unit 42 and customer service profile database 44 are connected to real-time processor 46 within billing system 30. *Id.* at 14:66–15:1. Real-time processor 46 computes charges for telephone calls while the telephone calls are in progress and updates parameters (e.g., prepaid balance, credit limit, prepaid rating, and postpaid rating) in a subscriber's customer service profile within customer service profile database 44 while a telephone call is in progress. *Id.* at 15:1–5, 15:39–45. Billing system 30 may then use this information to take certain actions in real time (e.g., requesting verification or alternate payment authorization, disconnecting an ongoing telephone call, and notifying the police of the most recent location of a detected fraudulent telephone call) via command generator 48 in response to charges associated with the telephone call. *Id.* at 15:6–14. These capabilities facilitate a wide range of billing and fraud prevention options. *See id.* at 15:39–67.

2. Kao

Kao is a chapter titled "An Overview of Real-Time Database Systems" within a book titled *Advances in Real-Time Systems*. Ex. 1006, i, 463. The chapter "give[s] an overview of the problems that arise in designing a real-time database system, and discuss[es] some of the possible solutions." *Id.* at 463. Kao describes "telephone switching (e.g., translating an 800 number into an actual number)" as an example of an application that might use a real-time database system. *Id.* at 463–64.

If memory is plentiful, much of the data for a real-time database system can reside in main memory, thus forming a memory resident database system (MRDBS). *Id.* at 479. According to Kao, MRDBSs have "many features, such as fast and predictable access time, which make [them] particularly suitable for real-time applications." *Id.*

One problem with storing data in MRDBSs is volatility because data stored in main memory do not survive power or CPU failures. *Id.* at 481. Kao teaches that backup storage on disks is one solution to the problem, though recovery protocols tied to disk storage with a transaction log "may be too slow for real-time applications." *Id.* As an alternative, Kao mentions a method of making a small part of main memory stable by using a separate battery backup. *Id.* Kao expressly references DeWitt as describing this technique. *Id.* at 481, 484.

3. DeWitt

DeWitt is an article titled "Implementation Techniques for Main Memory Database Systems" from the Proceedings of the Association for Computing Machinery's (ACM) Special Interest Group on Management of Data (SIGMOD) 1984 annual meeting. Ex. 1007, i, ii, 1. DeWitt addresses volatility in main memory databases and states that "a small portion of [main] memory can be made stable by providing it with a back-up battery power supply." *Id.* at 6 (§ 5.1); *see also id.* at 8 (§ 5.4) (same).

DeWitt also describes recovery schemes for main memory databases. *See id.* at 6–8 (§ 5). DeWitt states that "[a]n approach for reducing recovery time is to periodically checkpoint the database to stable storage," which "limits recovery activities to those transactions that are acting at the

checkpoint or [that] have begun since the last checkpoint." *Id.* at 7 (§ 5.3). DeWitt also describes that the stable portion of memory can be used to hold an in-memory log, "which can be viewed as a reliable disk output queue for log data." *Id.* at 8 (§ 5.4).

4. Claim 1

In its obviousness analysis for claim 1, Petitioner maps O'Neil's "in-process CDRs [call detail records]" to the recited "events" and contends that in-process CDRs are generated by "applications hosted or implemented by MSC [Mobile Switching Center] 13," which Petitioner maps to the "at least one system application." Pet. 51 (citing Ex. 1002 ¶ 97; Ex. 1005, 13:57–67, 14:29–40); *see also id.* at 52–53 (describing O'Neil's billing and fraud detection real-time applications from the perspective of billing system 30, which processes "in-process CDRs"). Petitioner further contends that in-process CDRs are processed by O'Neil's real-time monitoring unit 42 and real-time processor 46, both of which Petitioner maps to the recited "apparatus for processing events." *Id.* at 51–52 (citing Ex. 1002 ¶ 98; Ex. 1005, 15:1–14). Petitioner also maps O'Neil's real-time processor 46 to the recited "processor for executing code." *Id.* at 52 (citing Ex. 1002 ¶ 99). Petitioner contends an ordinarily skilled artisan would have understood that processor 46 "implement[s] . . . a portion of at least one real-time analysis engine" because "O'Neil's processor processes events for many of the same types of real-time applications disclosed by the '133 patent." *Id.* at 52–53. In particular, Petitioner cites O'Neil's billing and fraud detection capabilities. *Id.* at 53 (citing Ex. 1005, 6:21–26, 15:1–11, 15:39–67).

For the "main-memory database system," Petitioner cites O'Neil's prepaid telephone services database 58 and customer service profile database 44, but Petitioner acknowledges that O'Neil does not state whether these are in main memory. *Id.* at 54 (citing Ex. 1002 ¶ 102; Ex. 1005, 14:46–54, 16:9–10, Fig. 1). Petitioner relies on Kao for teaching the use of main memory databases, which have "fast and predictable access time[s]." *Id.* (quoting Ex. 1006, 479). For the recited "recovery information regarding a recovery point for the real-time analysis engine," Petitioner cites Kao's teaching on making a portion of main memory stable via a separate battery backup. *Id.* at 22 (citing Ex. 1006, 481–82), 55.

Petitioner contends an ordinarily skilled artisan "would have found it obvious to use the main-memory databases discussed in Kao in O'Neil's system" for either of O'Neil's databases. *Id.* at 54–55 (citing Ex. 1002 ¶ 103). Petitioner cites Kao for teaching that "main memory databases . . . have features such as fast and predictable access times that are 'very desirable' in real-time systems and 'may even be necessary if transactions have extremely tight time constraints.'" *Id.* at 55 (quoting Ex. 1006, 479, 481). Petitioner also cites Kao's comment that telephone switching is an example of an application with "stringent timing requirements" for which a real-time database would be useful. *Id.* at 56 (quoting Ex. 1006, 464). As such, Petitioner contends an ordinarily skilled artisan would have been motivated "to use Kao's main memory databases in O'Neil's real-time telephone call monitoring system . . . because (i) it was known that telephone routing and billing systems required tight timing requirements, and (ii) it was known that main memory databases are particularly suitable for these types of systems." *Id.* (citing Ex. 1002 ¶ 106). Characterizing

O'Neil's system as modular, Petitioner contends Kao's main memory database could have been added "in a 'plug-and-play' fashion" with routine skill in the art and predictable results. *Id.* (citing Ex. 1002 ¶ 107).

Petitioner further contends an ordinarily skilled artisan "would have found it . . . obvious to store recovery information regarding a recovery point for the real-time analysis engine in O'Neil (e.g., the real-time processor 46) in a main memory database system, as taught by Kao." *Id.* at 55; *see also id.* at 56 (same). According to Petitioner, storing Kao's recovery point in main memory "would have been a good idea" if Kao's main memory database were used in O'Neil's system. *Id.* at 57 (citing Ex. 1002 ¶ 108).

For claim 1, Petitioner cites DeWitt as follows: "To the extent Patent Owner contends Kao's teachings regarding storing recovery information on memory or on disk are insufficiently specific, [an ordinarily skilled artisan] would have found it obvious to refer to DeWitt for further implementation details, as Kao expressly cites to DeWitt for such details." *Id.* (citing Ex. 1002 ¶ 109; Ex. 1006, 481; Ex. 1007, 7–8).

Patent Owner calls into question Petitioner's stated motivation for combining Kao with O'Neil, namely, the purported "tight timing requirements" of O'Neil's real-time telephone call monitoring system. PO Resp. 14–15 (citing Pet. 56), 18–25. In particular, Patent Owner contends "O'Neil does not focus on event processing during the critical call-connection phase of a telephone call" in the same way that the '133 patent does. *Id.* at 20. According to Patent Owner, O'Neil's real-time processor 46 receives data from real-time monitoring unit 42 and "makes [a] determination about what actions to take ***as the call progresses***." *Id.* at 21 (citing Ex. 1005, 5:1–18; Ex. 2003 ¶ 62). Citing testimony from Dr. Jones,

Patent Owner contends that analysis made during the course of a call "is not bound by the call-connection target service/response time constraints of only a few milliseconds" discussed in the '133 patent. *Id.* at 21–22 (citing Ex. 2003 ¶ 64). Rather, Patent Owner contends the required response time is on the order of seconds. *Id.* at 21–23 (citing Ex. 1005, 17:4–7; Ex. 2003 ¶¶ 64–66; Ex. 2004, 127:18–128:7). Patent Owner also argues that, contrary to Petitioner's contention (Pet. 56), "upgrading databases 58 or 44, or any other database within O'Neil's billing system 30, [would not] have any impact on the call routing speeds because call routing is completed before the process reaches the billing system 30." PO Resp. 24 (citing Ex. 1005, 21:38–22:32, Fig. 6; Ex. 2003 ¶ 67).

We agree with Patent Owner that Petitioner's proffered reasoning to combine the references is inadequate. Petitioner's stated motivation to implement Kao's main memory database in O'Neil's real-time telephone call monitoring system is premised on the "tight timing requirements" of "telephone routing and billing systems." Pet. 56. Yet Patent Owner puts forth evidence that the timing requirement of O'Neil, which relates to monitoring of calls for billing purposes, is on the order of seconds. *See* PO Resp. 21–23; *see also* Ex. 1005, 17:4–7 (O'Neil stating that its "verification-and-deposit transaction preferably occurs within a few seconds during the course of the telephone call"), 18:65–67 (O'Neil stating that it seeks to prevent "*very large* fraudulent roaming charges," which indicates a relatively lower level of required timing responsiveness (emphasis added)); Ex. 2003 ¶ 64 (Dr. Jones testifying that "response target times of hundreds of milliseconds or even seconds . . . are adequate for O'Neil"). Patent Owner explains that, in the context of O'Neil's billing and call duration

application, the difference between checking a customer's balance every few milliseconds and every few seconds is not significant. PO Resp. 21–22 (citing Ex. 2003 ¶ 64)). Indeed, Petitioner's declarant, Dr. Gibbons, agreed during cross-examination that augmenting O'Neil's in-process CDRs once a second is acceptable and reasonable from a latency perspective. Ex. 2004, 127:18–128:7. This evidence undermines Petitioner's suggestion that O'Neil's telephone routing and billing system had "tight timing requirements" that would have warranted the use of a main memory database.

O'Neil does not specify the type of database used for customer service profile database 44 and prepaid telephone services database 58. *See* Pet. 54; Ex. 1002 ¶ 102. Dr. Jones testifies that the "vast majority of database systems" at the time of the '133 patent were disk-based database systems. Ex. 2003 ¶ 51. We credit this uncontested testimony because it is consistent with other evidence in the record. *See* Ex. 1001, 5:39–41 (calling disk-resident database systems "conventional"); Ex. 1002 ¶ 30 (Dr. Gibbons calling disk-based databases "conventional"); Ex. 2004, 45:4–46:2 (Dr. Gibbons testifying that commercial product lines for disk-based databases were "well developed and mature, [and] had been in place . . . for decades at the time of the invention."). Dr. Gibbons, also testified that a majority of database systems in 1999 were implemented using disks. Ex. 2006, 42:10–15. Considering that disk-based databases were conventional at the time the '133 patent was filed, Dr. Jones further testifies that disk-based databases had adequate latency to meet O'Neil's requirements. Ex. 2003 ¶¶ 51, 57, 64. Petitioner does not dispute this point. We again credit Dr. Jones's testimony because it is consistent with

Dr. Gibbons's testimony that once-per-second response times were adequate in O'Neil (*see* Ex. 2004, 127:18–128:7) and it is also consistent with the '133 patent's statement that "[a] single disk access can account for from tens to hundreds of milliseconds" (Ex. 1001, 5:42–44). We additionally note Dr. Gibbons's testimony that, in 1999, if one were able to "meet the deadlines that were set out and the predictability of the deadlines and the system throughput that [one] were targeting using a dis[k]-based system, then [one] may well have just done a dis[k]-based database." Ex. 2006, 42:22–43:2. Considering this evidence, we agree with Patent Owner (*see* PO Resp. 14–15) that the reasons articulated by Petitioner would not have motivated an ordinarily skilled artisan to use a main memory database—rather than a conventional disk-based database—in O'Neil's system.

Patent Owner also puts forth evidence showing that Petitioner's proposed modifications to O'Neil (i.e., upgrading O'Neil's database 44 and/or database 58 to main memory databases (*see* Pet. 56)) would not have affected the timing of O'Neil's call routing. *See* PO Resp. 23–24. According to Patent Owner, "O'Neil's MSC 13 'receives and routes' the communication in step 602 . . . , before the in-process CDRs are created and monitored in steps 604 and 606." *Id.* at 24 (citing Ex. 1005, 21:38–22:32, Fig. 6). Thus, Patent Owner argues that Petitioner's proposed modifications of database 44 and/or database 58 would not have had "any impact on the call routing speeds because call routing is completed before the process reaches the billing system 30." *Id.*

We agree with Patent Owner because Figure 6 of O'Neil illustrates that calls are routed before in-process CDRs (i.e., "events") are generated. *See* Ex. 1005, 21:38–22:32, Fig. 6. This undermines Petitioner's suggestion

(Pet. 56) that modifying O'Neil's databases 44 or 56 would have improved the timing of telephone routing/switching, a premise of Petitioner's rationale for the combination of references.[3]

As further evidence against Petitioner's proposed combination, Patent Owner argues that an ordinarily skilled artisan would have considered other disadvantages of main memory databases. Specifically, Patent Owner cites Kao's discussion that main memory databases were costly. PO Resp. 15–16 (citing Ex. 1006, 481; Ex. 2003 ¶ 53); *see also* Ex. 2004, 45:4–17 (Dr. Gibbons testifying that in 1999 main memory was "expensive"). Although Kao and Dr. Gibbons both recognize the price of memory continues to drop (Ex. 1006, 481; Ex. 2004, 46:6–7), Dr. Gibbons also testified that a cost difference still exists today between main memory and disk drives. Ex. 2004, 46:20–47:6. In fact, Dr. Gibbons further testified that "if cost was your primary driver you'd still go to disk-based systems" today. Ex. 2004, 47:6–9. Patent Owner also cites Kao's discussion and Dr. Jones's testimony that main memory was limited in capacity, which necessarily limits how much data could reside in a main memory database. *See* PO Resp. 15–16 (citing Ex. 1006, 481; Ex. 2003 ¶ 53). Thus, in the absence of other persuasive reasons to modify O'Neil, the record evidence of high cost and limited capacity associated with main memory databases tends to

[3] The fact that certain "events" in the '133 patent occur outside of the call-connection phase of a call (*see* Pet. Reply 8) does not salvage Petitioner's rationale for the combination in this regard. Petitioner premised its obviousness rationale at least partially on tight timing requirements for call routing (*see* Pet. 56), and its proposed modification of O'Neil's databases would not have resulted in faster call routing. *See* PO Resp. 24 (citing Ex. 1005, 21:38–22:32, Fig. 6).

undermine the implication that an ordinarily skilled artisan would have used main memory instead of conventional disk-based memory.

Patent Owner additionally cites Kao's discussion on the volatility of main memory databases posing a problem. PO Resp. 16 (citing Ex. 1006, 481; Ex. 2003 ¶ 54). Although Petitioner argues in reply that a "hybrid solution[] utilizing both main memory *and* disk" might alleviate these drawbacks (Pet. Reply 9–10), Petitioner's articulated rationale does not support implementing *any* portion of O'Neil's databases in main memory, given the adequacy of conventional disk-based databases for O'Neil's application. The availability of main memory volatility remedies (*see* Pet. 22; Pet. Reply 10) similarly would have not supported the use of main memory databases in O'Neil in the absence of an initial reason to do so.

Moreover, the challenged claims do not merely recite the presence of a main memory database; rather, they require storing recovery information in the main memory database. As noted above, to meet this limitation of the claims, Petitioner contends that "it would have been a good idea to . . . store recovery information regarding a recovery point for the main memory database . . . in main memory." Pet. 57. Given the volatility problems of main memory, namely that data stored therein do not survive a CPU failure, power failure, or system crash (*see* Pet. 15; Ex. 1006, 481; Ex. 1012, Abstract), it is unclear why it would have been a "good idea" to store recovery information in main memory. The very information necessary to recover from a failure—recovery information—would be lost in the failure or crash. *See* Ex. 1006, 481 ("Data stored in main memory usually do not survive through a power failure or a CPU failure."). Although Kao recommends a solution to the problem of main memory volatility—battery

backup for a small part of the memory (Ex. 1006, 481)—it is unclear why an ordinarily skilled artisan would have taken that path when there is no perceptible benefit from using main memory in the first place, as discussed above. At the very least, Petitioner has not adequately supported its "good idea" rationale for storing recovery information in the main memory database. We consider the added cost, limited capacity, and volatility of main memory databases at the time of the invention to be further reasons why an ordinarily skilled artisan would not have modified O'Neil's databases as proposed by Petitioner.

In its Reply, Petitioner highlights "improved access times that are desirable in real-time systems" as a purported reason why an ordinarily skilled artisan would have combined Kao and DeWitt with O'Neil. Pet. Reply 6–7 (citing Pet. 54–56; Ex. 1002 ¶¶ 105–107). Although the Petition references Kao's teachings on the desirability of faster access times in real-time systems (*see* Pet. 54, 55), Petitioner's rationale for the combination of O'Neil, Kao, and DeWitt is not based on a generalized desire for speed improvements. Rather, as discussed above, Petitioner contends "tight timing requirements" of "telephone routing and billing systems," such as O'Neil's system, would have motivated the combination. *See* Pet. 56. And Patent Owner's evidence shows that conventional databases were sufficiently fast to meet O'Neil's timing requirements. *See*, *e.g.*, Ex. 2003 ¶¶ 51, 57, 64. We are also mindful that "obviousness concerns whether a skilled artisan not only *could have made* but *would have been motivated to make* the combinations or modifications of prior art to arrive at the claimed invention." *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015). Petitioner's reliance on a generic desire for "improved access times"

in the Reply strikes us as merely a bald statement about what could have been achieved at the time of the invention.

At oral argument, Petitioner's counsel highlighted other parts of its Petition that allegedly support additional reasons for combining Kao with O'Neil. For example, Petitioner's counsel mentioned "a plug and play aspect of O'Neil that Dr. Gibbons had identified and worked through in the [P]etition" as being a separate reason for the combination. Tr. 18:16–21. This refers to Petitioner's contention that Kao's main memory database "can be readily dropped into the [O'Neil] system (e.g., in a 'plug-and-play' fashion)." Pet. 56 (citing Ex. 1002 ¶ 107). But as presented, this is actually a statement of anticipated success in combining the references, rather than an articulated reason to combine them in the first instance. *See id.* (stating that, as a result of the plug-and-play aspect of O'Neil's system, "this combination would have required nothing more than routine skill in the art, and would have had predictable results"). Just as in *Belden*, the fact that the combination might have been successful does not mean that an ordinarily skilled artisan would have been motivated to make the combination. *See Belden*, 805 F.3d at 1073.

At oral argument, Petitioner's counsel additionally mentioned improved throughput as another reason to combine O'Neil, Kao, and DeWitt. *See* Tr. 27:1–8. This purported reason is presented in Dr. Gibbons's second declaration (Ex. 1017 ¶ 17), which was submitted with Petitioner's Reply, and certain of Petitioner's demonstratives (Paper 31, 47–48). Patent Owner objects to Petitioner's arguments about throughput as not being timely, as not being developed in Petitioner's papers, and as not being supported by analysis and underlying facts in Dr. Gibbons's declaration. PO

Sur-Reply 10–11 n.3. Patent Owner also objects to Petitioner's Demonstrative Slide Nos. 47 and 48 for similar reasons. Paper 29, 1.

We agree with Patent Owner that throughput as an obviousness rationale is not developed in Petitioner's papers. At oral argument, Petitioner's counsel identified certain instances in which the Petition uses the word "throughput" (Tr. 65:8–24), but these references to throughput are not part of Petitioner's rationale for the combination in this ground. *See* Pet. 15 (describing Hvasshovd's discussion on main memory databases meeting throughput requirements), 52–53 (Petitioner's analysis for the "real-time analysis engine" limitation of claim 1 with a passing mention to "a high-throughput computer system"). We also agree with Patent Owner (PO Sur-Reply 10–11 n.3) that Petitioner makes no mention of throughput as an obviousness rationale in its Reply. Because this purported rationale is not properly presented in Petitioner's papers, we do not consider it in rendering this Decision. We also *sustain* Patent Owner's objections to Petitioner's Slide Nos. 47 and 48.

For these reasons, Petitioner has not established a persuasive reason for combining O'Neil, Kao, and DeWitt in the manner proposed by Petitioner. Based on the entire trial record, we determine that Petitioner has not established by a preponderance of the evidence that the subject matter of claim 1 would have been obvious over the combination of O'Neil, Kao, and DeWitt under 35 U.S.C. § 103(a).

5. Remaining Claims

Petitioner relies on the same deficient rationale for combining O'Neil, Kao, and DeWitt in its analysis of claims 9–13 and 21. *See* Pet. 55–63.

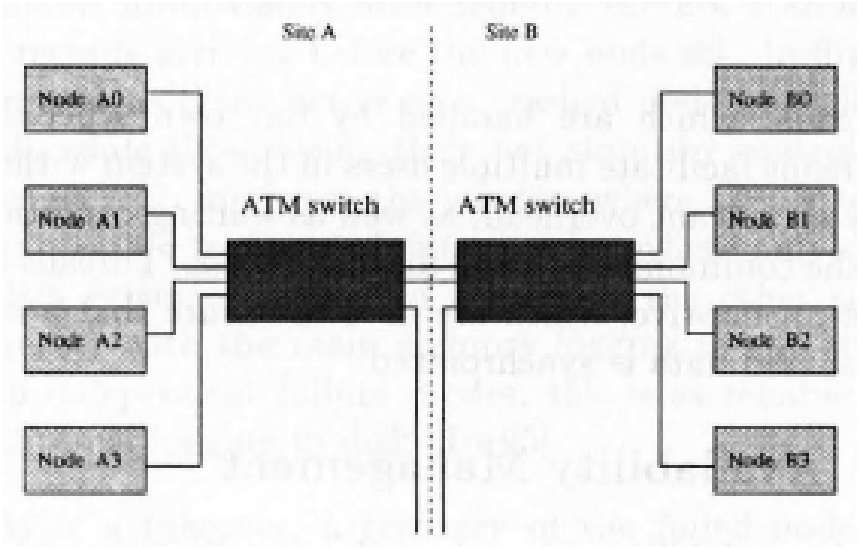
Thus, we also determine Petitioner has not shown by a preponderance of the evidence that the subject matter of claims 9–13 and 21 would have been obvious over the combination of O'Neil, Kao, and DeWitt.

C. Obviousness Ground Based on Hvasshovd, Kao, and DeWitt

Petitioner contends the subject matter of claims 1, 9–13, and 21 would have been obvious over Hvasshovd, Kao, and DeWitt. Pet. 16–47; Pet. Reply 16–27. Patent Owner disputes Petitioner's contentions. PO Resp. 34–63; PO Sur-Reply 15–26.

1. Hvasshovd

Hvasshovd is a paper directed to a telecommunications database prototype named "ClustRa" developed to run on standard workstations interconnected by an asynchronous transfer mode (ATM) switch. Ex. 1004, 469. Hvasshovd notes that telecommunications databases must fulfill very tough requirements on response time, throughput, and availability. *Id.* Thus, "[t]o meet the response time, ClustRa employs a main memory database for real-time data, main memory logging, and parallel intra-transaction execution." *Id.* at 470. Figure 1 of Hvasshovd is reproduced below.



Id. at 471. Figure 1 depicts an architecture of a database system having two sites with four nodes each. *Id.* at 470–71. "[T]he database system consists of a collection of interconnected nodes that are functionally identical and act as peers, without any node being singled out for a particular task." *Id.* at 471. Each node is a standard Unix workstation connected to an ATM switch. *Id.*

Regarding the type of storage employed in the database system, Hvasshovd describes the following:

> ClustRa is a traditional database server, in the sense that it manages a buffer of data with a disk-based layout in blocks . . . . However, it is main memory-based in the sense that tables may be declared to reside in main memory. Unlike pure main memory databases, this allows for many classes of queries and transactions, not limited to those requiring real-time response.

Id. (citations omitted).

2. Claim 1

In its obviousness analysis for claim 1, Petitioner maps Hvasshovd's specialized servers (SCPs) in a network and standard Unix workstation nodes to the recited "apparatus for processing events." Pet. 24 (citing

Ex. 1004, 469–71). Petitioner also maps Hvasshovd's clients to the recited "at least one system application" and contends that requests from such clients are the recited "events." *Id.* Petitioner explains that "Hvasshovd's 'transaction controller' is responsible for receiving requests from clients, and coordinating the execution of the requested transactions." *Id.* at 25 (citing Ex. 1004, 472).

For the "processor for executing code," Petitioner cites Hvasshovd's Unix workstation nodes, which each include a central processing unit. *Id.* at 27 (citing Ex. 1002 ¶ 58; Ex. 1004, 470–71). Petitioner contends that services in each node (i.e., a "transaction controller," a "database kernel," a "node supervisor," and an "update channel") "work together to process 'events,' such as requests from clients to access (e.g., read, update, delete, and/or modify) portions of a database." *Id.* at 27–28 (citing Ex. 1004, 472). According to Petitioner, these services "comprise a portion of a high-throughput computer system that aggregates or processes computer events," which an ordinarily skilled artisan would understand to meet the limitation regarding "a portion of at least one real-time analysis engine" for "process[ing] the events." *Id.* at 28 (citing Ex. 1002 ¶ 59).

Regarding the recited "main-memory database system," Petitioner cites Hvasshovd's ClustRa database, which is implemented in main memory. *Id.* at 30–31 (citing Ex. 1002 ¶ 63; Ex. 1004, Abstract, 470). Although the ClustRa database can be configured to store data blocks on disk (*see id.* at 31 (citing Ex. 1004, 471)), Petitioner contends an ordinarily skilled artisan would consider the ClustRa database to be a main memory database "because it can store data in main memory so as to allow access to that data at main memory speeds." *Id.* at 31–32 (citing Ex. 1002 ¶ 64). And

Petitioner further contends that "it would have been trivial and obvious" for a user to "declare that every data block and relational table in the ClustRa database should be stored in main memory, and not on disk." *Id.* at 32 (citing Ex. 1002 ¶ 65; Ex. 1004, 471).

Petitioner cites Hvasshovd, Kao, and DeWitt for teaching "recovery information regarding a recovery point for the real-time analysis engine." *Id.* at 32–36. In particular, Petitioner cites Hvasshovd's "main-memory logging technique," which, for example, writes a log to main memory of another node with an independent failure mode. *Id.* at 33 (citing Ex. 1004, 473, 476). Petitioner maps Hvasshovd's teachings on checkpointing for node recovery to the recited "recovery point." *Id.* at 33–34 (citing Ex. 1002 ¶ 70; Ex. 1004, 474). From Kao, Petitioner cites a teaching on storing recovery information on disk whereby a transaction log is used to bring a database up-to-date. *Id.* at 34–35 (citing Ex. 1006, 481–82). According to Petitioner, Kao explains that storing recovery information on disk may be too slow for some applications, so Kao also teaches that certain recovery information can be stored in main memory that is backed up by a separate battery. *Id.* at 35 (citing Ex. 1006, 481–82). Petitioner additionally cites DeWitt for teaching checkpointing and logging using a portion of memory backed up by a power supply. *Id.* at 36 (citing Ex. 1007, 6–8). Petitioner notes that Kao itself cites DeWitt for these teachings. *Id.*

Petitioner contends "it would have been obvious to use the main memory databases described by Kao in Hvasshovd's system" to the extent "Hvasshovd alone does not disclose a pure main memory database." *Id.* at 37. Petitioner contends an ordinarily skilled artisan would have been motivated to make this combination based on common teachings in the

references about main memory databases being useful where real-time speed is necessary. *Id.* (citing Ex. 1002 ¶ 75; Ex. 1004, Abstract; Ex. 1006, 465, 479). Citing testimony from Dr. Gibbons, Petitioner also contends an ordinarily skilled artisan would have appreciated Kao's teachings on storing a recovery point in a non-volatile way (i.e., via main memory backed by a battery) as addressing a practical implementation problem for main memory databases. *Id.* at 37–38 (citing Ex. 1002 ¶ 76). Petitioner further contends an ordinarily skilled artisan would have looked to DeWitt, which is expressly cited in Kao, for implementation details on how to store recovery information. *Id.* at 38 (citing Ex. 1002 ¶ 77).

In our Decision on Institution, we determined preliminarily that "Petitioner's mapping [for claim 1] does not give any explanation about why or how an ordinarily skilled artisan would have considered Hvasshovd's client to be a system application." Dec. on Inst. 25. We based our determination on the following passage from the Petition, which we found to constitute Petitioner's "entire argument" and which we found to be devoid of "citations or analysis to support Petitioner's contention that a client in Hvasshovd may be regarded as a 'system application'":

> Hvasshovd also explains that these apparatuses are for ***processing events generated by at least one system application.*** These "events" can include requests from system applications (which Hvasshovd calls "clients") that require accessing the ClustRa database.

Id. (quoting Pet. 24).

In its Reply, Petitioner argues that an ordinarily skilled artisan "would have readily understood that a client as described by Hvasshovd would be synonymous with a 'system application' as recited by the '133 patent." Pet. Reply 17 (citing Ex. 1017 ¶ 33). According to Petitioner, "where

Hvasshovd describes requests made by its ***clients***, a[n ordinarily skilled artisan] would recognize that those requests are coming from ***applications***." *Id*. at 17–18 (citing Ex. 1017 ¶ 34). In support of this assertion, Petitioner cites Dr. Jones's cross-examination testimony for the proposition that clients typically have software and that applications can act as clients. *Id.* at 17 (citing Ex. 1016, 23:4–12, 37:6–14, 38:16–25).

Patent Owner argues that we should again determine that Petitioner has failed to prove that Hvasshovd's clients are "system applications" that generate events. PO Resp. 43; PO Sur-Reply 18. Patent Owner calls Petitioner's reply arguments "untimely" such that we should not consider them. PO Sur-Reply 16.

Patent Owner additionally argues that Petitioner does not account for the "system" aspect of a "system application." PO Resp. 41–43. In particular, Patent Owner argues Figure 2 of Hvasshovd depicts clients that are external to Hvasshovd's system, and Patent Owner contends Petitioner "dodges" this argument in Petitioner's Reply. *Id*. at 41–42; PO Sur-Reply 16 (both citing Ex. 1004, Fig. 2). Rather, according to Patent Owner, "Petitioner now argues Hvasshovd's client is the claimed system application merely because it is software." PO Sur-Reply 17 (citing Pet. Reply 17–18). Patent Owner additionally notes Dr. Gibbons's cross-examination testimony wherein he was not sure about what was meant in the '133 patent by a client and server being on "the same system." PO Resp. 35–36; PO Sur-Reply 17–18 (both citing Ex. 1001, 6:23–25; Ex. 2001, 82:2–7). Thus, Patent Owner contends Petitioner has failed to "include some explanation for why an external 'client' in Hvasshovd is a '***system*** application' given Hvasshovd's teachings." PO Resp. 42.

Having considered the additional briefing submitted since our Decision on Institution, we determine that Petitioner's mapping of the recited "system application" to Hvasshovd's client remains fatally flawed. Petitioner's obviousness contentions on page 24 of the Petition include neither supporting evidence nor analysis to undergird its proposed mapping to Hvasshovd. *See* Tr. 29:14–15 (Petitioner's counsel conceding that Petitioner's mapping is "not described"). We also agree with Patent Owner (PO Sur-Reply 16) that Petitioner's reply arguments attempting to justify its mapping of the "system application" to Hvasshovd's client are untimely. Specifically, Petitioner cites an additional declaration from Dr. Gibbons and a book ("The Benchmark Handbook"; Ex. 1009)[4] as support that an ordinarily skilled artisan would have considered Hvasshovd's client to be a system application (Pet. Reply 17–18), but this new rationale and evidence exceed the scope of a proper reply. *See* 37 C.F.R. § 42.23(b) ("A reply may only respond to arguments raised in the corresponding opposition"); Trial Practice Guide Update (Aug. 2018)[5], 15 ("'[R]espond,' in the context of § 42.23(b), does not mean embark in a new direction with a new approach as compared to positions taken in a prior filing . . . . It is . . . improper to present in reply new evidence (including new expert testimony) that could have been presented in a prior filing . . . ."). Petitioner's new rationale explaining its claim mapping in the Reply is not based on a previous position Petitioner put forth in the Petition; rather, Petitioner posits a rationale about

[4] Although Petitioner argues this book was "filed with the Petition" (Pet. Reply 18), Petitioner never previously cited the passage now relied upon in the Reply.

[5] Available at https://go.usa.gov/xU7GP.

an ordinarily skilled artisan's perspective where none existed previously. We may refuse to consider arguments in a reply brief where, as here, they represent an entirely new rationale. *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369–70 (Fed. Cir. 2016). Accordingly, we do not consider Petitioner's new rationale because it is an improper reply argument.

And, even considering Petitioner's untimely rationale, Patent Owner points out a deficiency in Petitioner's new analysis. In its Response, Patent Owner argues that Hvasshovd depicts its client as external to its system. PO Resp. 40 (citing Ex. 1004, Fig. 2). Although Petitioner argues in reply that Hvasshovd's client amounts to an application (*see* Pet. Reply 17–19), Petitioner offers no analysis on how it gives effect to the word "system" in the recited "system application." In addition, Petitioner does not provide a consistent theory about how to interpret "system" in light of the '133 patent specification. Petitioner argues in reply that an ordinarily skilled artisan considering the '133 patent would have recognized the "the client (and the server, in this instance) would be processes—or system applications—running on the same hardware (i.e., 'system.')." Pet. Reply 19 (emphasis omitted) (citing Ex. 1017 ¶ 36). But Dr. Gibbons agreed during cross-examination that locating various elements of a network on the same physical hardware "does not necessarily mean that those elements are on the same system." Ex. 2006, 11:11–17; *see also id.* at 5:21–6:3 (Dr. Gibbons testifying that "[y]ou can be physically in the same location but be on different systems."). And Dr. Gibbons was not sure how to interpret whether a client and server are on "the same system" consistent with the '133 patent specification. Ex. 2004, 82:2–7. Thus, even considering

Petitioner's untimely arguments, these arguments do not persuasively show how or why any ordinarily skilled artisan would have considered Hvasshovd's client to be a "*system* application."

For these reasons, Petitioner has not established that the combination of Hvasshovd, Kao, and DeWitt teaches or suggests a "system application" commensurate with claim 1. Based on the entire trial record, we determine that Petitioner has not established by a preponderance of the evidence that the subject matter of claim 1 would have been obvious over the combination of Hvasshovd, Kao, and DeWitt under 35 U.S.C. § 103(a).

3. Remaining Claims

Petitioner relies on the same deficient analysis for the recited "system application" with respect to claims 9–13 and 21. *See* Pet. 38–47. Thus, we also determine Petitioner has not shown by a preponderance of the evidence that claims 9–13 and 21 would have been obvious over the combination of Hvasshovd, Kao, and DeWitt.

III. CONCLUSION

Petitioner has not demonstrated by a preponderance of the evidence that claims 1, 9–13, and 21 of the '133 patent would have been obvious based on either of the instituted grounds of unpatentability.

IV. ORDER

Accordingly, it is:

ORDERED that, on the record before us, Petitioner has not shown by a preponderance of the evidence that claims 1, 9–13, and 21 of the '133 patent are unpatentable;

FURTHER ORDERED that Patent Owner's objections (Paper 29, 1) to Petitioner's Demonstrative Slide Nos. 47 and 48 (Paper 31, 47–48) are *sustained*; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to this proceeding seeking judicial review of our Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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