

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,
Petitioner,

v.

NETWORK SYSTEM TECHNOLOGIES, LLC,
Patent Owner.

IPR2024-00338
Patent 7,373,449 B2

Before CHARLES J. BOUDREAU, JOHN R. KENNY, and
STEVEN M. AMUNDSON, *Administrative Patent Judges*.

AMUNDSON, *Administrative Patent Judge*.

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

I. INTRODUCTION

Samsung Electronics Co., Ltd. (“Petitioner”) filed a Petition requesting an *inter partes* review of claims 1–6 and 9–16 in U.S. Patent No. 7,373,449 B2 (Exhibit 1001, “the ’449 patent”) under 35 U.S.C. §§ 311–319. Paper 2 (“Pet.”). Network System Technologies, LLC (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”). Further, after receiving Board authorization to address certain issues, Petitioner filed a Preliminary Reply, and Patent Owner filed a Preliminary Sur-reply. *See* Paper 8 (“Prelim. Reply”); Paper 9 (“Prelim. Sur-reply”); Ex. 3001.

Under 37 C.F.R. § 42.4(a), we have authority to determine whether to institute an *inter partes* review. We may institute an *inter partes* review only if “the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a) (2018). The “reasonable likelihood” standard is “a higher standard than mere notice pleading” but “lower than the ‘preponderance’ standard to prevail in a final written decision.” *Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29 at 13 (PTAB Dec. 20, 2019) (precedential).

Based on the current record and for the reasons explained below, Petitioner has shown that there is a reasonable likelihood that it would prevail with respect to at least one of the challenged claims. Thus, we institute an *inter partes* review of claims 1–6 and 9–16 in the ’449 patent on all challenges included in the Petition.

II. BACKGROUND

A. Real Parties in Interest

Petitioner identifies the following real parties in interest: Samsung Electronics Co., Ltd.; Samsung Semiconductor, Inc.; Samsung Electronics America, Inc.; and Samsung Austin Semiconductor, LLC. Pet. 72. Patent Owner identifies itself as the sole real party in interest. Paper 4, 2. The parties do not raise any issue about real parties in interest.

B. Related Matters

Petitioner and Patent Owner identify the following civil actions as related matters:

- *Network System Technologies, LLC v. Samsung Electronics Co., Ltd. et al.*, No. 2:22-cv-00481 (E.D. Tex. filed Dec. 19, 2022) (the “Samsung litigation”);
- *Network System Technologies, LLC v. Texas Instruments Inc.*, No. 2:22-cv-00482 (E.D. Tex. filed Dec. 19, 2022) (the “TI litigation”);
- *Network System Technologies, LLC v. Qualcomm Inc. et al.*, No. 1:22-cv-01331 (W.D. Tex. filed Dec. 19, 2022) (the “Qualcomm litigation”);
- *Network System Technologies, LLC v. Lenovo Group Ltd.*, No. 2:23-cv-00167 (E.D. Tex. Apr. 11, 2023);
- *Network System Technologies, LLC v. Ford Motor Co.*, No. 2:23-cv-00440 (E.D. Tex. filed Sept. 26, 2023); and
- *Network System Technologies, LLC v. OnePlus Technology (Shenzhen) Co., Ltd.*, No. 2:23-cv-00520 (E.D. Tex. filed Nov. 14, 2023).

Pet. 72; Paper 4, 2.

Patent Owner identifies the following Board proceedings as related matters:

- *Samsung Electronics Co., Ltd. v. Network System Technologies, LLC*, IPR2024-00339 (Patent 8,086,800 B2);
- *Qualcomm Inc. and Samsung Electronics Co., Ltd. v. Network System Technologies, LLC*, IPR2024-00343 (Patent 7,594,052 B2); and
- *Qualcomm Inc. and Samsung Electronics Co., Ltd. v. Network System Technologies, LLC*, IPR2024-00355 (Patent 8,072,893 B2).

Paper 4, 3.

C. The '449 Patent (Exhibit 1001)

The '449 patent, titled “Apparatus and Method for Communicating in an Integrated Circuit,” issued on May 13, 2008, from an application filed on October 7, 2003. Ex. 1001, codes (22), (45), (54). The patent names Andrei Radulescu and Kees Goossens as inventors. *Id.* at code (75). The patent states that the invention “relates to an integrated circuit having a plurality of processing modules and a network arranged for providing connections between processing modules and a method for exchanging messages in such an integrated circuit.” *Id.* at 1:7–11; *see id.* at code (57).

The '449 patent explains that systems on chip (SoCs) employ a modular approach where “the processing system comprises a plurality of relatively independent, complex modules.” Ex. 1001, 1:15–26. The patent also explains that networks on chip (NoCs) have the following advantages over a bus connecting the modules in an SoC: first, “NoCs help resolve the electrical problems in new deep-submicron technologies”; and second, “NoCs also decouple computation from communication, which is essential in managing the design of billion-transistor chips.” *Id.* at 1:30–46.

According to the '449 patent, however, using NoCs with SoCs raises “new issues that must be taken into account” because “the modules communicate remotely via network nodes” in an NoC. Ex. 1001, 1:50–56. “As a result, interconnect arbitration changes from centralized to distributed, and issues like out-of order [sic] transactions, higher latencies, and end-to-end flow control must be handled either by the intellectual property block (IP) or by the network.” *Id.* at 1:56–60.

The '449 patent notes that many issues concerning on-chip networks “have been already the subject of research in the field of local and wide area networks (computer networks),” i.e., off-chip networks. Ex. 1001, 1:56–63. According to the patent, many topics concerning off-chip networks “are very much related to on-chip networks,” and many of the results off chip “are also applicable on chip.” *Id.* at 1:63–66. The patent cautions, however, that differences between off-chip networks and on-chip networks may require “network design choices [to] be reevaluated” and lead “to different design choices.” *Id.* at 1:66–2:4. For instance, the patent states, “NoC’s premises are different from off-chip networks, and, therefore, most of the network design choices must be reevaluated.” *Id.* at 1:66–2:1.

The '449 patent explains that the invention rests on “the idea to allow connection channels of a connection with different connection properties.” Ex. 1001, 7:32–34. Thus, “the utilization of the resources of a network on chip is more efficient, since the connection between modules can be efficiently adapted to their actual requirement such that the connection is not over dimensioned and unused network resources can be assigned to other connections.” *Id.* at 7:26–31.

A “connection is considered as a set of channels, each having a set of connection properties, between a first module and at least one second module.” Ex. 1001, 8:50–52. The “connection properties” include, among other things, (1) “flow control (a remote buffer is reserved for a connection, and a data producer will be allowed to send data only when it is guaranteed that space is available for the produced data),” (2) “throughput (a lower bound on throughput is guaranteed),” and (3) “latency (upper bound for latency is guaranteed).” Ex. 1001, 8:62–9:3; *see id.* at 9:51–65.

The ’449 patent’s Figure 1 (reproduced below) depicts an example SoC:

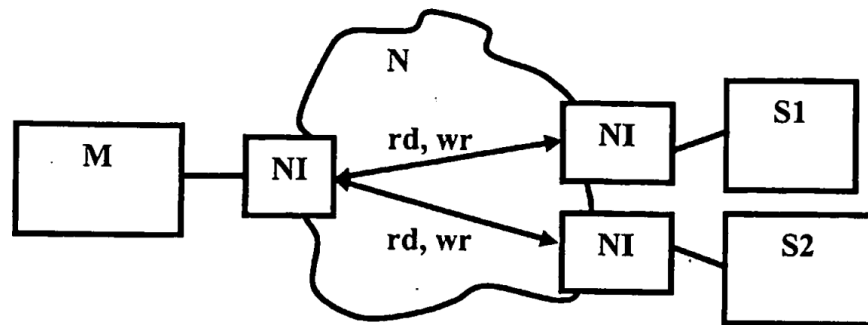


FIG. 1

Figure 1 illustrates an SoC including a master module M, a first slave module S1, and a second slave module S2. Ex. 1001, 8:33–34, 9:4–6, Fig. 1. “Each module is connected to a network N via a network interface NI, respectively.” *Id.* at 9:6–7, Fig. 1.

The “network interfaces NI are provided to manage the communication of the respective modules and the network N, so that the modules can perform their dedicated operation without having to deal with communication with the network or other modules.” Ex. 1001, 9:9–14. The

“network interfaces NI can send requests such as read and write between each other over the network.” *Id.* at 9:14–16.

The '449 patent's Figure 3 (reproduced below) depicts another example SoC:

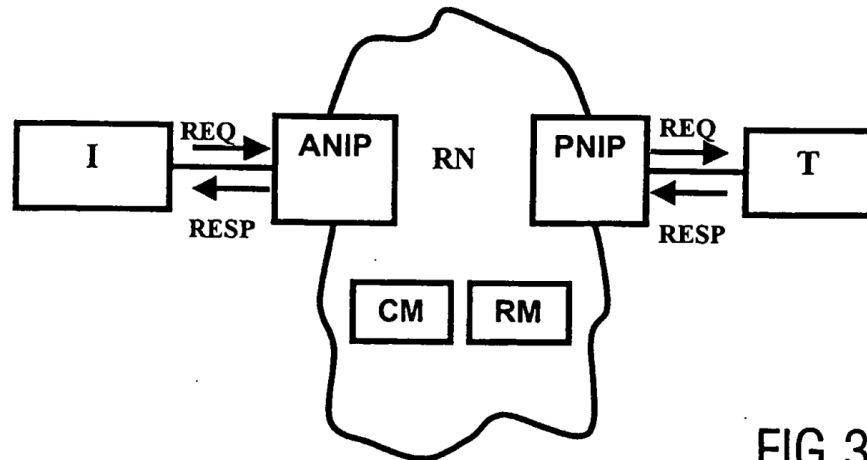


FIG.3

Figure 3 illustrates an SoC including an initiator module I (a master), a target module T (a slave), and a router network RN. Ex. 1001, 8:37–38, 9:17–19, 9:26–29, 9:66–10:1, Fig. 3.

The router network RN includes an active network interface port ANIP connected to the initiator module I and a passive network interface port PNIP connected to the target module T. Ex. 1001, 9:26–29, Fig. 3. The “communication between the initiator module I and the target module T is based on request-response transactions, where the master, i.e. the initiator module I initiates a transaction by placing a request, possibly with some data or required connection properties.” *Id.* at 9:29–34.

The “request REQ is delivered to the slave, i.e. the target module T, via the active network interface port ANIP, the network RN and the passive network interface port PNIP.” Ex. 1001, 9:34–37. The “request is executed

by the target module T and data is returned as a response RESP if necessary or required.” *Id.* at 9:37–39.

The router network RN also includes “a communication manager CM and a resource manager RM.” Ex. 1001, 9:67–10:3, Fig. 3. In Figure 3, “the communication manager CM and the resource manager RM are arranged in the router network RN, but they can also be arranged in one or some of the network interfaces NI.” *Id.* at 10:3–6.

The “communication manager CM request[s] a connection with a set of properties between two modules from the resource manager RM, after receiving the request REQ from the active network interface ports ANIP” where “the properties of a connection, e.g. throughput, flow control, are to be requested when asking for a connection setup.” Ex. 1001, 10:19–24. The “resource manager RM allocates the necessary resources and enquires if such a connection based on these resources is possible.” *Id.* at 10:24–26.

After determining “the available connection properties, the resource manager RM reserves the available connection i.e. the required resources, and responds to the communication manager CM which connection is available, i.e. which connection properties or the required resources thereof are available for the desired channels.” Ex. 1001, 10:41–46. Optionally, “the communication manager CM can accept the connection with the available properties, but on the other hand the communication manager CM may also refuse the offered connection if the available properties or the resources thereof are not acceptable.” *Id.* at 10:46–51.

If “the communication manager CM refuses the offered connection, it sends an error message to the initiator module I (i.e. via the ANIP) and requests the resource module RM to release the reservation of said

connections.” Ex. 1001, 10:51–54. Otherwise, “the resource manager RM sets the connection properties, and establishes a connection with accepted properties between said initiator and target modules.” *Id.* at 10:55–57.

D. The Challenged Claims

Petitioner challenges the following claims:

- (i) independent claim 1 for an “[i]ntegrated circuit”;
- (ii) claims 2–6 and 9 that depend directly or indirectly from claim 1;
- (iii) independent claim 10 for a “[m]ethod for exchanging messages in an integrated circuit”; and
- (iv) claims 11–16 that depend directly from claim 10.

Pet. 9, 15–68.

After Petitioner filed the Petition, Patent Owner statutorily disclaimed claims 1 and 3–5. Ex. 2062, 3; *see* Prelim. Resp. 13 n.1, 41 n.4.

Claim 10 exemplifies the challenged claims and reads as follows (with formatting added for clarity and with bracketed numbers and letters added for reference purposes):¹

10. [10.pre.1] Method for exchanging messages in an integrated circuit comprising a plurality of modules, the messages between the modules being exchanged over connections via a network,

[10.pre.2] wherein said connections comprises [sic] a set of communication channels each having a set of connection properties, any communication channel being independently configurable,

[10.pre.3] wherein said connection through the network supports transactions comprising at least one of outgoing

¹ We use the same numbers and letters that Petitioner uses to identify the claim language. *See* Pet. 42–45.

messages from the first module to the second module and return messages from the second module to the first module

and further comprising the steps of:

[10.a] the first module issuing a request for a connection with the second module to a communication manager, wherein the request comprises desired connection properties associated with the sets of communication channels;

[10.b] the communication manager forwarding the request to a resource manager;

[10.c] the resource manager determining whether a target connection with the desired connection properties is available;

[10.d] the resource manager responding with the availability of the target connection to the communication manager; and

[10.e] the target connection between the first and second module being established based on the available properties of said communication channels of said connection.

Ex. 1001, 19:21–20:6.

E. The Asserted References

For its challenges, Petitioner relies on the following references:

Name	Reference	Exhibit
Goossens2002	Kees Goossens et al., <i>Networks on Silicon: Combining Best-Effort and Guaranteed Services</i> , Proceedings of the 2002 Design, Automation and Test in Europe Conference and Exhibition, 1–3 (March 2002)	1005
Drake	US 5,461,611, issued October 24, 1995 (based on an application filed June 7, 1994)	1006
Goossens2003	Kees Goossens et al., <i>Guaranteeing the Quality of Services in Networks on Chip</i> , Chapter 4 in <i>Networks on Chip</i> , Kluwer Academic Publishers (Axel Jantsch & Hannu Tenhunen eds., 2003)	1007

Pet. 7–68.

Petitioner asserts that:

- (1) Goossens2002 qualifies as prior art “under 35 U.S.C. §§ 102(a) and (b)”;
- (2) Drake qualifies as prior art “under 35 U.S.C. §§ 102(a), (b), and (e)”;
- (3) Goossens2003 qualifies as prior art “under 35 U.S.C. § 102(a).”

Pet. 8; *see* 35 U.S.C. § 102(a), (b), (e) (2006).²

At this stage of the proceeding, and as explained below, Patent Owner disputes that Goossens2002 and Goossens2003 qualify as prior art. *See infra* § IV.D.3. Specifically, Patent Owner asserts that the references were not publicly accessible and, therefore, not “printed publications” under § 102(a) and § 102(b). *See, e.g.*, Prelim. Resp. 39–41; Prelim. Sur-reply 3–5.

F. The Asserted Challenges to Patentability

Petitioner asserts the following challenges to patentability:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–6, 9–16	103(a)	Goossens2002, Drake
1–6, 9–16	103(a)	Goossens2003, Drake

Pet. 9, 15–68.

G. Testimonial Evidence

To support its challenges, Petitioner relies on the declaration of Todd Mowry, Ph.D. (Exhibit 1003). Dr. Mowry states, “I have been retained as an

² The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284 (2011), amended 35 U.S.C. § 102 and § 103 effective March 16, 2013. Because the filing date of the challenged claims predates the AIA’s amendments to § 102 and § 103, this decision refers to the pre-AIA versions of § 102 and § 103.

expert witness on behalf of” Petitioner. Ex. 1003 ¶ 2. Dr. Mowry also states, “I received an M.S. in Electrical Engineering from Stanford University in June 1989, and a Ph.D. in Electrical Engineering from Stanford University in March 1994,” and “am a Professor in the Department of Computer Science at Carnegie Mellon University.” *Id.* ¶¶ 6, 8.

Further, Petitioner relies on the declarations of Gordon MacPherson (Exhibit 1025) and Sean O’Bryan (Exhibit 1027) to establish the public accessibility of Goossens2002 and Goossens2003, respectively, before the ’449 patent’s filing date.

To support its positions, Patent Owner relies on the declaration of Erik Chmelar, Ph.D. (Exhibit 2001). Dr. Chmelar states, “I have been retained on behalf of” Patent Owner as “an expert consultant.” Ex. 2001 ¶ 2.

Dr. Chmelar also states, “In 2001, I received an M.S. degree in Electrical Engineering from Stanford University, with a focus on computer networks In 2004, I received a Ph.D. degree in Electrical Engineering from Stanford University, with a primary focus on very large-scale integrated (VLSI) systems” *Id.* ¶ 6.

III. DISCRETIONARY DENIAL IN VIEW OF PARALLEL LITIGATION

Under § 314(a), the Director possesses “broad discretion” in deciding whether to institute an *inter partes* review. *See* 35 U.S.C. § 314(a); *Saint Regis Mohawk Tribe v. Mylan Pharms. Inc.*, 896 F.3d 1322, 1327 (Fed. Cir. 2018). The Director is “permitted, but never compelled,” to institute an *inter partes* review. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1367 (Fed. Cir. 2016). The Board decides whether to institute an *inter partes* review on the Director’s behalf. 37 C.F.R. § 42.4(a) (2023).

Based on *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential) (“*Fintiv*”), Patent Owner argues that we should exercise our discretion under § 314(a) to deny institution in view of the Samsung litigation. *See* Prelim. Resp. 1, 26–39; *supra* § II.B. Petitioner argues that we should decline to exercise our discretion under § 314(a) to deny institution. *See* Pet. 70–71.

A. Nonexclusive Factors to Consider

When deciding whether to exercise discretion under § 314(a) to deny institution, the Board has considered the status of litigation involving the parties in light of the AIA’s objective “to provide an effective and efficient alternative to district court litigation.” *NHK Spring Co. v. Intrix-Plex Techs., Inc.*, IPR2018-00752, Paper 8 at 12, 19–20 (PTAB Sept. 12, 2018) (precedential) (“*NHK*”). The Board has set forth the following nonexclusive factors to consider when determining whether to exercise discretion under § 314(a) to deny institution due to the advanced state of parallel litigation:

- (1) whether the court granted a stay or evidence exists that one may be granted if the Board institutes a trial;
- (2) the proximity of the court’s trial date to the Board’s projected statutory deadline for a final written decision;
- (3) the investment in the parallel litigation by the court and the parties;
- (4) the overlap in the issues raised by the petition and the issues in the parallel litigation;
- (5) whether the petitioner and the defendant in the parallel litigation are the same party; and
- (6) other circumstances that impact the Board’s exercise of discretion, including the merits.

Fintiv, IPR2020-00019, Paper 11 at 5–6.

These factors “relate to whether efficiency, fairness, and the merits support the exercise of authority to deny institution in view of an earlier trial date in the parallel proceeding.” *Fintiv*, IPR2020-00019, Paper 11 at 6. Further, *Fintiv* instructs that the Board should take “a holistic view of whether efficiency and integrity of the system are best served by denying or instituting review.” *Id.*; see PTAB Consolidated Trial Practice Guide at 55–56, 58 (Nov. 2019) (“CTPG”).³

We also follow the Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation (June 21, 2022) (“Interim Procedure”).⁴

B. Analysis

The Interim Procedure instructs that “the PTAB will not discretionarily deny institution in view of parallel district court litigation where a petitioner presents a stipulation not to pursue in a parallel proceeding the same grounds or any grounds that could have reasonably been raised before the PTAB.” Interim Procedure at 3 (citing *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 (PTAB Dec. 1, 2020) (precedential as to § II.A)); see *id.* at 7, 9. The Interim Procedure also explains that such a stipulation (a *Sotera* stipulation) “mitigates concerns of potentially conflicting decisions and duplicative efforts between the district court and the PTAB.” *Id.* at 7.

³ Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

⁴ Available at https://www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621_.pdf.

Petitioner presents a *Sotera* stipulation in the Petition. Pet. 70–71. Specifically, Petitioner stipulates as follows:

Petitioner hereby stipulates “that, if the PTAB institutes *inter partes* review, ‘Petitioner will not pursue in [*Network System Technologies, LLC v. Samsung Electronics Co., Ltd. et al.*, No. 2:22-cv-00481 (E.D. Tex.) (“the Samsung district court case”)] the specific grounds [asserted in this petition], or . . . any other ground that was raised or could have been reasonably raised in an IPR.’”

Id. at 70 (alterations by Petitioner) (quoting *Sotera*, IPR2020-01019, Paper 12 at 13–14).

Patent Owner does not dispute that Petitioner presents a *Sotera* stipulation in the Petition. *See, e.g.*, Prelim. Resp. 35–38. Instead, Patent Owner asserts that Petitioner has not filed the *Sotera* stipulation with the district court or “otherwise formalized the stipulation.” *Id.* at 37. But Patent Owner cites no authority that a *Sotera* stipulation takes effect only when filed with a district court or “otherwise formalized.” *See id.* at 36–38.

Patent Owner also asserts that Samsung litigation will still involve issues concerning Goossens2002 and Goossens2003 because Petitioner cites those references, among others, to support an inequitable-conduct defense. *See* Prelim. Resp. 36–38 (citing Ex. 2029, 58–59). For instance, Petitioner asserts in the Samsung litigation that Goossens2002 and Goossens2003 are “material to patentability” as relevant to the claimed “resource manager” but were withheld from the Office during the ’449 patent’s prosecution. Ex. 2029, 49, 58–59.

Here, however, Petitioner relies primarily on Drake as teaching the claimed “resource manager.” *See infra* §§ IV.E.3(b), IV.F.2(b). Patent Owner does not explain how Petitioner’s inequitable-conduct defense in the

Samsung litigation raises issues that substantially overlap with the issues here. *See, e.g.*, Prelim. Resp. 35–38.

In any event, when discussing a *Sotera* stipulation, the Interim Procedure does not exempt from the stipulation’s operation cases where a party has asserted an inequitable-conduct defense. *See, e.g.*, Interim Procedure at 3, 7–9.

Patent Owner asserts that the Interim Procedure was “issued in violation of the notice-and-comment rulemaking set forth in 5 U.S.C. § 553(b).” Prelim. Resp. 28. According to Patent Owner, the Director “may adopt substantive rules only through notice-and-comment rulemaking.” *Id.* (citing 5 U.S.C. § 553). Patent Owner also asserts that the Director’s “suggestion” in the Interim Procedure that “a *Sotera* stipulation alone precludes discretionary denial is improper and inconsistent with the statute.” *Id.* (citing Interim Procedure at 7–8). Additionally, Patent Owner notes that the Interim Procedure’s “legality” is “currently being challenged in *Apple Inc. v. Iancu*, No. 5:20-cv-06128-EJD (N.D. Cal.).” *Id.* at 29.

We note Patent Owner’s argument. The district court, however, has not ordered the Office to not apply *Fintiv* or the Interim Procedure (Ex. 3002, 22–23), and under the Board’s Standard Operating Procedure 2, Rev. 11, the Interim Procedure is binding on the Board. SOP2, Rev. 11, p. 2 (available at https://www.uspto.gov/sites/default/files/documents/20230724_ptab_sop2_rev11_.pdf).

Because Petitioner presents a *Sotera* stipulation, we decline to exercise our discretion under § 314(a) to deny institution in view of the Samsung litigation. *See* Interim Procedure at 3, 7, 9.

IV. PATENTABILITY ANALYSIS

A. Legal Principles: Obviousness

A patent may not be obtained “if the differences between the subject matter sought to be patented 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.” 35 U.S.C. § 103(a) (2006). An obviousness analysis involves underlying factual inquiries including (1) the scope and content of the prior art; (2) differences between the claimed invention and the prior art; (3) the level of ordinary skill in the art; and (4) where in evidence, objective indicia of nonobviousness, such as commercial success, long-felt but unsolved needs, and failure of others.⁵ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18, 35–36 (1966); *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1047–48 (Fed. Cir. 2016) (en banc). When evaluating a combination of references, an obviousness analysis should address “whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

We analyze the obviousness issues according to these principles.

B. Level of Ordinary Skill in the Art

Factors pertinent to determining the level of ordinary skill in the art include (1) the educational level of the inventor; (2) the type of problems encountered in the art; (3) prior-art solutions to those problems; (4) the

⁵ A “patentee has the burden of going forward with rebuttal evidence,” e.g., evidence of objective indicia of nonobviousness. *See Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1360 (Fed. Cir. 2007). Here, Patent Owner does not address objective indicia of nonobviousness. *See, e.g., Prelim. Resp.* 4–12, 39–63.

rapidity with which innovations are made; (5) the sophistication of the technology; and (6) the educational level of workers active in the field. *Envtl. Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 696–97 (Fed. Cir. 1983). Not all factors may exist in every case, and one or more of these or other factors may predominate in a particular case. *Id.* These factors are not exhaustive, but merely a guide to determining the level of ordinary skill in the art. *Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007). Moreover, the prior art itself may reflect an appropriate skill level. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

Petitioner asserts that a person of ordinary skill in the art at the time of the alleged invention “would have had at least a Bachelor’s degree in computer science, electrical engineering, computer engineering, or an equivalent technical degree, and two or more years of experience with system-on-chip, interconnect, or networking technologies.” Pet. 14. Petitioner also asserts that “[a]dditional education would compensate for less experience, and vice-versa.” *Id.* Dr. Mowry’s testimony supports Petitioner’s assertions. *See* Ex. 1003 ¶¶ 59–61.

In this proceeding, Patent Owner does not describe a person of ordinary skill in the art. *See, e.g.*, Prelim. Resp. 4–21, 39–63. In the TI litigation, however, Patent Owner described a person of ordinary skill in the art as follows:

an individual having at least: a Bachelor of Science (or equivalent) degree in electrical engineering, computer engineering, or a related field, and 2–3 years of work experience in very large-scale integrated (“VLSI”) systems, such as application-specific integrated circuits (“ASICs”), application-specific standard parts (“ASSPs”), system-on-chip

(“SoC”), or field-programmable gate arrays (“FPGAs”), and has an understanding of on-chip interconnection networks.

Ex. 1020, 7.⁶

In the TI litigation, district court determined that a person of ordinary skill in the art would have had “at least a Bachelor’s degree in electrical engineering, computer engineering, or a related field, and as [sic] at least two years of work experience in the field of [system-on-chip] SoC and [network-on-chip] NoC technologies.” Ex. 2022, 18.⁷

These three descriptions of an ordinarily skilled artisan generally agree on an educational level (a Bachelor’s degree) and an experience level (at least two years of work experience). Pet. 14; Ex. 1020, 7; Ex. 2022, 18.

For purposes of analysis at this stage of the proceeding, we adopt Petitioner’s description of an ordinarily skilled artisan because it comports with the technology and claims of the ’449 patent as well as the asserted references. *See* Ex. 1003 ¶¶ 60–61. At this stage of the proceeding, neither party contends that any differences between the respective descriptions of an ordinarily skilled artisan would impact the patentability analysis. During the instituted trial, we encourage the parties to address any such differences and explain how those differences impact the patentability analysis.

⁶ For Exhibit 1020 (Opening Claim Construction Brief by Plaintiff Network System Technologies, LLC), we cite to the page numbers of the brief rather than the header page numbers.

⁷ For Exhibit 2022 (Claim Construction Order), we cite to the page numbers that Patent Owner applied to the exhibit, which are the same as the header page numbers.

C. Claim Construction

1. GENERAL PRINCIPLES

We construe claim terms “using the same claim construction standard” that district courts use to construe claim terms in civil actions under 35 U.S.C. § 282(b). *See* 37 C.F.R. § 42.100(b). Under that standard, claim terms “are given their ordinary and customary meaning, which is the meaning the term would have to a person of ordinary skill in the art at the time of the invention.” *Power Integrations, Inc. v. Fairchild Semiconductor Int’l, Inc.*, 904 F.3d 965, 971 (Fed. Cir. 2018) (citing *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc)). The meaning of claim terms may be determined by “look[ing] principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17).

2. PETITIONER’S POSITION

Petitioner contends that “the Board does not need to construe any claim term for purposes of evaluating the prior art.” Pet. 15.

Petitioner notes that “parties in parallel proceedings have argued” that § 112’s means-plus-function provision applies to the term “communication manager.” Pet. 33 n.3 (citing Ex. 1019, 12–13);⁸ *see* 35 U.S.C. § 112 ¶ 6 (2006). Petitioner also notes that Patent Owner disagrees that § 112’s

⁸ For Exhibit 1019 (Local Patent Rule 4-3 Joint Claim Construction and Prehearing Statement), we cite to the page numbers that Petitioner applied to the exhibit, which are the same as the header page numbers.

means-plus-function provision applies to the term “communication manager.” *Id.*

Petitioner asserts that if the Board determines that § 112’s means-plus-function provision applies to the term “communication manager,” then “its structure is ‘circuit’ and one court preliminarily found its structure is ‘portion of the circuit configured to implement the scheme disclosed in the ’449 patent at 10:19–24, 10:41–54.’” Pet. 33 n.3 (citation omitted) (quoting Ex. 2022, 41). Petitioner also asserts that “these structures are disclosed and/or rendered obvious.” *Id.*; *see id.* at 32–34, 38, 44, 60, 63, 66; *infra* §§ IV.E.3(b)(i).a, IV.F.2(b)(i).a.

3. PATENT OWNER’S POSITION

Patent Owner does not ask the Board to explicitly construe any claim term. *See, e.g.*, Prelim. Resp. 13–26; Prelim. Sur-reply 1–3. Patent Owner notes that the “parties in the various district court cases have proposed, and in some cases agreed to, various constructions.” Prelim. Resp. 19; *see id.* at 19–21.

Patent Owner contends that the parties in the Samsung litigation proposed the following competing constructions for the term “communication manager”:

Term	Petitioner’s Proposed Construction	Patent Owner’s Proposed Construction
“communication manager”	Subject to Section 112, ¶ 6 Function: forwarding a request to a resource manager Structure: portion of the circuit configured to implement the scheme disclosed in the ’449 Patent at 10:19–24, 10:41–54 Otherwise, indefinite.	Plain and ordinary meaning If subject to Section 112, ¶ 6: Function: forward a request for a connection to the resource manager Structure: circuit

Prelim. Resp. 17 (citing Ex. 2033, 11–12).⁹

Patent Owner asserts that the Board should deny institution because Petitioner failed to “sufficiently disclose” its litigation means-plus-function construction for the term “communication manager” and Petitioner takes “inconsistent positions” concerning that term in this proceeding and the Samsung litigation. Prelim. Resp. 18, 22; *see id.* at 1, 25–26; Prelim. Sur-reply 1–3. Patent Owner faults Petitioner for referring to “unspecified ‘parties in parallel proceedings’ having proposed a means-plus-function construction for communication manager but fail[ing] to inform the Board that Petitioner is one of those parties.” Prelim. Resp. 25 (quoting Pet. 33 n.3).

4. ANALYSIS

“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.” *Vivid Techs., Inc. v.*

⁹ For Exhibit 2033 (Local Patent Rule 4-3 Joint Claim Construction and Prehearing Statement), we cite to the page numbers that Patent Owner applied to the exhibit, which are the same as the header page numbers.

Am. Sci. & Eng'g, Inc., 200 F.3d 795, 803 (Fed. Cir. 1999); *see Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). Based on the current record, we determine that no claim term requires an explicit construction to decide whether Petitioner satisfies the “reasonable likelihood” standard for instituting trial. Also, we disagree with Patent Owner that Petitioner’s claim-construction positions warrant denying institution.

The Board’s rules require that a petition specify “[h]ow the challenged claim is to be construed.” 37 C.F.R. § 42.104(b)(3). Further, “[w]here the claim to be construed contains a means-plus-function or step-plus-function limitation as permitted under” § 112, “the construction of the claim must identify the specific portions of the specification that describe the structure, material, or acts corresponding to each claimed function.” *Id.*

“If a petitioner believes that a claim term requires an express construction, the petitioner must include a statement identifying a proposed construction of the particular term and where the intrinsic and/or extrinsic evidence supports that meaning.” CTPG at 44. “On the other hand, a petitioner may include a statement that the claim terms require no express construction.” *Id.*

Here, Petitioner contends that “the Board does not need to construe any claim term for purposes of evaluating the prior art,” i.e., that “the claim terms require no express construction.” Pet. 15. Regarding the term “communication manager,” Petitioner explains that it proposed an “alternative construction” if the Board determines that § 112’s means-plus-function provision applies to that term. Prelim. Reply 5 (citing Pet. 33 n.3).

Specifically, Petitioner asserts that if the Board determines that § 112's means-plus-function provision applies to the term "communication manager," "its structure is 'circuit.'" Pet. 33 n.3. Also, Petitioner identifies "the specific portions of the specification that describe the structure" corresponding to the claimed function, i.e., "the scheme disclosed in the '449 patent at 10:19–24, 10:41–54." *Id.*; see 37 C.F.R. § 42.104(b)(3). In the Samsung litigation, Petitioner identified the same portions of the specification when contending that § 112's means-plus-function provision applies to the term "communication manager." Ex. 2033, 11–12; Ex. 2035, 11.¹⁰

D. Whether Petitioner Establishes a Reasonable Likelihood that Goossens2002 and Goossens2003 Are Printed Publications

1. GENERAL PRINCIPLES

"Whether a reference qualifies as a printed publication under § 102 is a legal conclusion based on underlying fact findings." *Acceleration Bay, LLC v. Activision Blizzard Inc.*, 908 F.3d 765, 772 (Fed. Cir. 2018). In an *inter partes* review, a petitioner has "the burden to prove" that a reference "is a printed publication." *Id.*

To qualify as a printed publication, a reference "must have been sufficiently accessible to the public interested in the art." *In re Cronyn*, 890 F.2d 1158, 1160 (Fed. Cir. 1989). The Federal Circuit has described public accessibility as "the touchstone in determining whether a reference constitutes" a printed publication under § 102. *Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1348 (Fed. Cir. 2016) (quoting *In re Hall*,

¹⁰ For Exhibit 2035 (Samsung's Responsive Claim Construction Brief), we cite to the page numbers of the brief rather than the header page numbers.

781 F.2d 897, 898–99 (Fed. Cir. 1986)). The Federal Circuit has “interpreted § 102 broadly, finding that even relatively obscure documents qualify as prior art so long as the relevant public has a means of accessing them.” *GoPro, Inc. v. Contour IP Holding LLC*, 908 F.3d 690, 693 (Fed. Cir. 2018).

A patent challenger establishes public accessibility by demonstrating that a reference was “disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art, exercising reasonable diligence, can locate it.” *Jazz Pharm., Inc. v. Amneal Pharm., LLC*, 895 F.3d 1347, 1355–56 (Fed. Cir. 2018). “When there is an established publisher there is a presumption of public accessibility as of the publication date.” *VidStream LLC v. Twitter, Inc.*, 981 F.3d 1060, 1065 (Fed. Cir. 2020).

At the institution stage of an *inter partes* review, “the statutory ‘reasonable likelihood’ standard for institution applies to the issue of whether a reference is a printed publication.” *Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29 at 12 (PTAB Dec. 20, 2019) (precedential) (citing 35 U.S.C. § 314(a)). Hence, a petitioner must “identify with particularity evidence sufficient to establish a reasonable likelihood that the reference was publicly accessible” before the challenged patent’s effective filing date and “therefore that there is a reasonable likelihood that it qualifies as a printed publication.” *Id.* at 16; *see id.* at 13.

2. PETITIONER’S POSITION

Petitioner contends that Goossens2002 was “published and publicly available” no later than August 7, 2002, i.e., fourteen months before the ’449 patent’s October 7, 2003, filing date. *See* Pet. 8–9; Prelim. Reply 1.

As support, Petitioner submits a declaration from Gordon MacPherson (Exhibit 1025).

Mr. MacPherson testifies that he serves as “Director, Board Governance & Policy Development of The Institute of Electrical and Electronics Engineers, Incorporated (‘IEEE’)” and acts as “a custodian of certain records for IEEE.” Ex. 1025 ¶¶ 1, 4. Mr. MacPherson also testifies that “[i]t is the regular practice of IEEE to publish articles and other writings including article abstracts and make them available to the public,” e.g., “through the IEEE digital library, IEEE Xplore.” *Id.* ¶¶ 6–7.

Mr. MacPherson further testifies that Goossens2002 was (1) published in “Proceedings 2002 Design, Automation and Test in Europe Conference and Exhibition,” which took place from March 4 to March 8, 2002, and (2) “made available no later than the last day of the conference.” *Id.* ¶¶ 8, 11.

As further support, Petitioner submits IEEE bibliographic data for Goossens2002 (Exhibit 1026). The IEEE bibliographic data includes the following information: “Date of Conference: 04-08 March 2002” and “Date Added to IEEE Xplore: 07 August 2002.” Ex. 1026, 1.

Petitioner contends that Goossens2003 was “published and publicly available” no later than January 31, 2003, i.e., more than eight months before the ’449 patent’s October 7, 2003, filing date. *See* Pet. 8–9; Prelim. Reply 2. As support, Petitioner submits a declaration from Sean O’Bryan (Exhibit 1027).

Mr. O’Bryan testifies that he serves as “a librarian at University of Texas Libraries (‘UT Libraries’)” and is “familiar with the routine record-keeping practices of UT Libraries.” Ex. 1027 ¶¶ 2, 4. Mr. O’Bryan also

testifies that the book titled “Networks on Chip” edited by Axel Jantsch and Hannu Tenhunen, which includes Goossens2003 as chapter 4, is “in the UT Libraries’ collection” and was “catalogued on April 16, 2003.” *Id.* ¶ 5.

Mr. O’Bryan further testifies that “[a]t the time of the acquisition of ‘Networks on Chip’, the UT Libraries typically made newly catalogued items available to the public within 3 business days of cataloging.” *Id.* ¶ 7.

As further support, Petitioner submits SpringerLink bibliographic data for Goossens2003 (Exhibit 1028). Petitioner explains that “Kluwer Academic Publishers, the original publisher of *Networks on Chip*, merged with Springer in 2004.” Prelim. Reply 3 n.2. The SpringerLink bibliographic data includes the following information: “Published: 31 January 2003” and “Publisher: Springer New York, NY.” Ex. 1028, 4.

As additional support, Petitioner submits “Plaintiff Network System Technologies, LLC’s Responses to Qualcomm’s First Set of Requests for Admission (Nos. 1–9)” (Exhibit 1031) from the Qualcomm litigation. In that exhibit, Patent Owner states, “NST admits that ‘*Networks on Chip*’ edited by Axel Jantsch and Hannu Tenhunen was publicly available as of January 31, 2003.” Ex. 1031, 5.

When contending that Goossens2002 and Goossens2003 were “published and publicly available” before the ’449 patent’s October 7, 2003, filing date, Petitioner states as follows:

Supporting documentation and testimonial evidence demonstrate that Goossens2002 and Goossens2003 are printed publications that were publicly available prior to the ’449 Patent’s priority date. *See* Ex-1025; Ex-1027; Ex-1028; *Hulu*, Paper 29 at 12–14, 17–21.

Pet. 8–9.

3. PATENT OWNER’S POSITION

Patent Owner contends that Petitioner violated the Board’s rules by failing to provide “a detailed explanation of the significance of” the MacPherson declaration (Exhibit 1025) and the O’Bryan declaration (Exhibit 1027). Prelim. Resp. 40 (citing 37 C.F.R. § 42.22(a)(2); *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016)); *see* Prelim. Sur-reply 3–4. According to Patent Owner, the Petition (1) “invites the Board to review the entirety of the declarations to divine the possible bases for Goossens2002 and Goossens2003 allegedly being accessible” and (2) employs “impermissible incorporation by reference” in “an improper attempt to circumvent the word limit for the Petition.” Prelim. Resp. 40–41; *see* Prelim. Sur-reply 4.

Patent Owner contends that the Board should disregard “Plaintiff Network System Technologies, LLC’s Responses to Qualcomm’s First Set of Requests for Admission (Nos. 1–9)” (Exhibit 1031). Prelim. Sur-reply 5. Specifically, Patent Owner asserts that Petitioner could have submitted that exhibit with the Petition but instead “chose” to submit it with the Preliminary Reply. Prelim. Sur-reply 5. Patent Owner also asserts that “it is black letter law that responses to requests for admission ‘cannot be used against the party in any other proceeding.’” *Id.* (quoting Fed. R. Civ. P. 36(b)).

4. ANALYSIS

Based on the current record, Petitioner establishes a reasonable likelihood that Goossens2002 and Goossens2003 are printed publications that were publicly available before the ’449 patent’s October 7, 2003, filing

date. *See* Pet. 8–9; Prelim. Reply 1–4; Ex. 1025 ¶¶ 8, 11; Ex. 1026, 1; Ex. 1027 ¶¶ 5, 7; Ex. 1028, 4.

Mr. MacPherson testifies that Goossens2002 was (1) published in “Proceedings 2002 Design, Automation and Test in Europe Conference and Exhibition,” which took place from March 4 to March 8, 2002, and (2) “made available no later than the last day of the conference.” Ex. 1025 ¶¶ 8, 11. Bibliographic data corroborates his testimony. Ex. 1026, 1.

Mr. O’Bryan testifies that the book titled “Networks on Chip,” which includes Goossens2003 as chapter 4, is “in the UT Libraries’ collection” and was “catalogued on April 16, 2003.” Ex. 1027 ¶ 5. Bibliographic data corroborates his testimony. Ex. 1028, 4.

At this stage of the proceeding, Patent Owner identifies no evidence refuting Petitioner’s evidence of public accessibility. *See* Prelim. Resp. 39–41; Prelim. Sur-reply 3–5.

Under the circumstances here, we do not view Petitioner’s short statement about the relevance of the MacPherson declaration (Exhibit 1025) and the O’Bryan declaration (Exhibit 1027) as violating the Board’s rules. *See* Pet. 8–9. The MacPherson declaration comprises twelve short paragraphs on two pages. Ex. 1025. The O’Bryan declaration comprises nine short paragraphs on two pages. Ex. 1027. For these declarations, pinpoint citations to particular paragraphs are unnecessary to discern the significance of the evidence.

At this stage of the proceeding, we do not rely on “Plaintiff Network System Technologies, LLC’s Responses to Qualcomm’s First Set of Requests for Admission (Nos. 1–9)” (Exhibit 1031). That exhibit properly responds to Patent Owner’s arguments because “a petitioner is entitled to

respond to new arguments made in a patent owner response.” *See Axonics, Inc. v. Medtronic, Inc.*, 75 F.4th 1374, 1380 (Fed. Cir. 2023); *Rembrandt Diagnostics, LP v. Alere, Inc.*, 76 F.4th 1376, 1384–85 (Fed. Cir. 2023); 37 C.F.R. § 42.23(b). But Rule 36 in the Federal Rules of Civil Procedure provides that “[a]n admission under this rule is not an admission for any other purpose and cannot be used against the party in any other proceeding.” Fed. R. Civ. P. 36(b). At this stage of the proceeding, Petitioner identifies no exception to that provision. *See* Prelim. Reply 1–4.

*E. Alleged Obviousness over Goossens2002
and Drake: Claims 1–6 and 9–16*

Petitioner contends that claims 1–6 and 9–16 are unpatentable under § 103(a) as obvious over Goossens2002 and Drake. *See* Pet. 9, 15–48; Prelim. Reply 6–7. As discussed above, Patent Owner statutorily disclaimed claims 1 and 3–5. Ex. 2062, 3; *see* Prelim. Resp. 13 n.1, 41 n.4; *supra* § II.D. Patent Owner disputes that claims 2, 6, and 9–16 are unpatentable under § 103(a) as obvious over Goossens2002 and Drake. *See* Prelim. Resp. 41–56; Prelim. Sur-reply 5–6.

Below, we provide overviews of Goossens2002 and Drake. Then, we consider the obviousness issues. As explained below, Petitioner establishes sufficiently for purposes of institution that the combined disclosures in Goossens2002 and Drake teach the subject matter in claims 2, 6, and 9–16.

1. OVERVIEW OF GOOSSENS2002 (EXHIBIT 1005)

Goossens2002 is a paper titled “Networks on Silicon: Combining Best-Effort and Guaranteed Services” by Kees Goossens et al., published in Proceedings of the 2002 Design, Automation and Test in Europe Conference and Exhibition (March 2002). Ex. 1005, 1; Ex. 1025 ¶¶ 8–11.

Goossens2002 discloses (1) a system on silicon (SOS) based on the “intellectual-property block (IP) re-use model” containing “hundreds of IPs” and (2) a network on silicon (NOS) for communication between the IPs. Ex. 1005, 1. The IPs “interact in many different ways,” such as “event-driven, data streaming, message passing, shared memory, etc.” *Id.* at 2.

Goossens2002 explains that a “router network based on packet switching” alleviates various problems in a system on silicon because “wires are shared, or made programmable, by introducing switches (routers).” Ex. 1005, 1. With a “router network based on packet switching,” IPs “communicate only using the network so that their layout and timing closure are independent of other IPs,” thus decoupling “computation (IPs) and communication (NOS).” *Id.* “Although a NOS based on packet-switching has its costs (packetisation, routers, buffering, harder to give guarantees) it is essential for an IP re-use strategy because it enables compositional and scalable integration of the IPs.” *Id.* at 2.

Goossens2002 also explains that an NOS “with guaranteed services simplifies programming individual IPs.” Ex. 1005, 2. Among other things, an NOS with guaranteed services eases integration into larger systems because “some IPs have inherent performance requirements, such as a minimum throughput (for real-time streaming data), or bounded latency (for interrupts).” *Id.* Also, “services that are guaranteed to an IP are not affected by other IPs in the network, making reasoning about the IP in isolation possible.” *Id.* at 3. “At run-time an application or quality-of-service manager reconfigures the SOS.” *Id.*

Goossens2002 discloses an NOS supporting “both guaranteed and best-effort services.” Ex. 1005, 3. The services include “uncorrupted

transmission, lossless transmission, in-order delivery, throughput, jitter (delay variation), and latency.” *Id.* at 2. The NOS uses “a combination of circuit and packet switching.” *Id.* at 3.

In the NOS supporting “both guaranteed and best-effort services,” a “channel implements a simplex point-to-point communication between two network interfaces (possibly with multiple paths).” Ex. 1005, 3. A “connection combines multiple channels.” *Id.* Combining connections permits “half duplex” and “full duplex” connections. *Id.* at 2. A “channel can have a combined throughput and latency guarantee (GT), or be best effort (BE), with an unspecified finite latency upper bound.” *Id.* at 3.

A connection may include flow control. Ex. 1005, 3. “Flow control avoids data loss by aligning IP production and consumption rates.” *Id.* at 2.

In the NOS supporting “both guaranteed and best-effort services,” (1) “GT streams use time-division-multiplexed circuit switching” and (2) “BE packets use worm-hole source routing.” Ex. 1005, 3. “GT traffic is tightly scheduled to minimise buffering.” *Id.* “BE traffic use[s] all spare capacity in the network, i.e. bandwidth that is not reserved or unused by GT traffic.” *Id.*

In the NOS supporting “both guaranteed and best-effort services,” the “programming of IPs is compositional because their services are independent of each other.” Ex. 1005, 3. Also, “[q]uality-of-service managers can effectively observe and steer” the NOS because “it behaves predictably in terms of performance and cost.” *Id.*

2. OVERVIEW OF DRAKE (EXHIBIT 1006)

Drake is a U.S. patent titled “Quality of Service Management for Source Routing Multimedia Packet Networks,” filed on June 7, 1994, and

issued on October 24, 1995. Ex. 1006, codes (22), (45), (54). Drake states that the invention “relates to multimedia packet transmission systems and, more particularly, to insuring [sic] adequate quality of service (QoS) for transmission of multimedia signals in local area networks.” *Id.* at 1:8–11.

Drake explains that “[m]ultimedia information, particularly audio and full motion video, has unique properties that impose stringent requirements on the communications network.” Ex. 1006, 1:22–24. For example, “[u]nexpected network delays caused by throughput or processing delays can disrupt the presentation of the multimedia data to the end user.” *Id.* at 1:22–24. Additionally, “packet or cell based networks do not inherently guarantee the delivery of a specified quantity of data in each time interval of a specified duration.” *Id.* at 1:50–52.

According to Drake, “a method is required in those packet networks to provide equivalent levels of network service for the multimedia applications.” Ex. 1006, 1:52–55. “This function can be called bandwidth management, or more broadly, quality of service (QoS) management.” *Id.* at 1:55–57. To improve performance in local area networks, Drake discloses a QoS management system for local area networks that “ensures selected levels of quality of service to all transmission requests submitted to the management system.” *Id.* at code (57); *see id.* at 2:26–41.

Drake's Figure 1 (reproduced below) depicts a QoS management system:

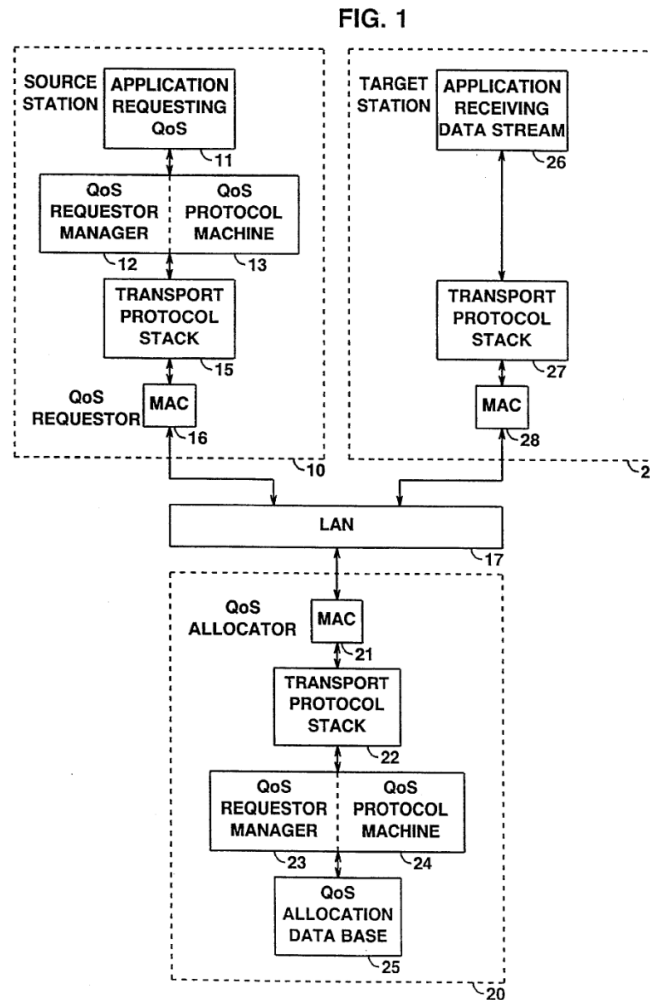


Figure 1 illustrates a QoS management system including source station 10, QoS allocator 20, and target station 29 connected to one another by local area network (LAN) 17. Ex. 1006, 3:36–40, 4:18–26, Fig. 1.

As shown in Figure 1, source station 10 includes application 11 that “requests a QoS connection to the destination or target station 29.” Ex. 1006, 4:27–30, Fig. 1. Source station 10 also includes QoS requestor manager 12 and QoS protocol machine 13. *Id.* at 4:32–34, Fig. 1. “Together, components 12 and 13 assemble a request to reserve a QoS

connection for a multi-media data stream on [a] path through the LAN 17 between source station 10 and target station 29.” *Id.* at 4:34–37. More particularly, “QoS requestor manager 12 interacts with application 11 using internal messages as is well known in the art and utilizes QoS protocol machine 13 to format the QoS request.” *Id.* at 4:62–65. Source station 10 additionally includes transport protocol stack 15 for formatting a packet and medium access control (MAC) entity 16 for launching a packet into LAN 17. *Id.* at 4:37–40, Fig. 1.

As shown in Figure 1, target station 29 includes application 26 “capable of receiving and utilizing the multimedia data stream transmitted from” application 11 in source station 10. Ex. 1006, 4:48–50, Fig. 1. Target station 29 also includes transport protocol stack 27 and MAC entity 28. *See id.* at 4:40–47, Fig. 1.

As shown in Figure 1, QoS allocator 20 includes MAC entity 21, transport protocol stack 22, QoS requestor manager 23, QoS protocol machine 24, and QoS allocation database 25. Ex. 1006, 4:67–5:9, Fig. 1. QoS requestor manager 23 “together with QoS protocol machine 24 receives, decodes and acts upon the QoS request from source station 10.” *Id.* at 5:5–8. QoS requestor manager 23 uses the data in QoS allocation database 25 when “carrying out its management functions.” *Id.* at 5:8–9.

QoS allocation database 25 “contains all of the quality of service parameters for each of the components of LAN 17, as well as descriptions of all of the data streams already accepted by allocator 20 and the detailed constituents of the connection paths for each of those data streams.” Ex. 1006, 5:9–14; *see id.* at 6:29–8:19, Fig. 2.

QoS allocator 20 “receive[s] the QoS request from station 10, examine[s] the resources of LAN 17, and determine[s] if a path exists in LAN 17 between station 10 and station 29 which satisfies the requested level of QoS.” Ex. 1006, 4:50–54; *see id.* at 2:32–40. “If the QoS exists, it is assigned to this QoS data stream.” *Id.* at 4:54–55; *see id.* at 2:40–41. “If the QoS is not available, station 10 is notified of the lack of an adequate QoS path to the intended destination.” *Id.* at 4:55–57; *see id.* at 2:18–21, 2:41. QoS allocator 20 “manages the QoS requests for the entire LAN 17.” *Id.* at 4:66–67; *see id.* at code (57).

Drake identifies various service parameters that “describe the service expected from the network” including the following QoS parameters:

- Throughput—Forward Direction: “[t]he average throughput in bits per second over an interval of length T from source station 10 to target station 29”;
- Throughput—Backward Direction: “[t]he average throughput in bits per second over an interval of length T from the target station 29 to the source station 10”;
- End-to-End Delay—Forward Direction: “[t]he maximum elapsed time between the storage of a packet in the LAN entry device at source station 10 and the reception of the packet from the LAN exit device at target station 29”;
- and
- End-to-End Delay—Backward Direction: “[t]he maximum elapsed time between the storage of a packet in the LAN entry device at the target station 29 and the reception of the packet from the LAN exit device at source station 10.”

Ex. 1006, 5:30–50.

In addition to separate QoS parameters in the forward and backward directions on a transmission path, Drake discloses the following traffic

descriptors indicating the “type of service,” e.g., “access priority, synchronous, asynchronous, etc.,” in the forward and backward directions on a transmission path:

- Access Class—Forward Direction: “[t]he type of service to be provided by the LAN segment of source station 10”; and
- Access Class—Backward Direction: “[t]he type of service to be provided by the LAN segment of target station 29.”

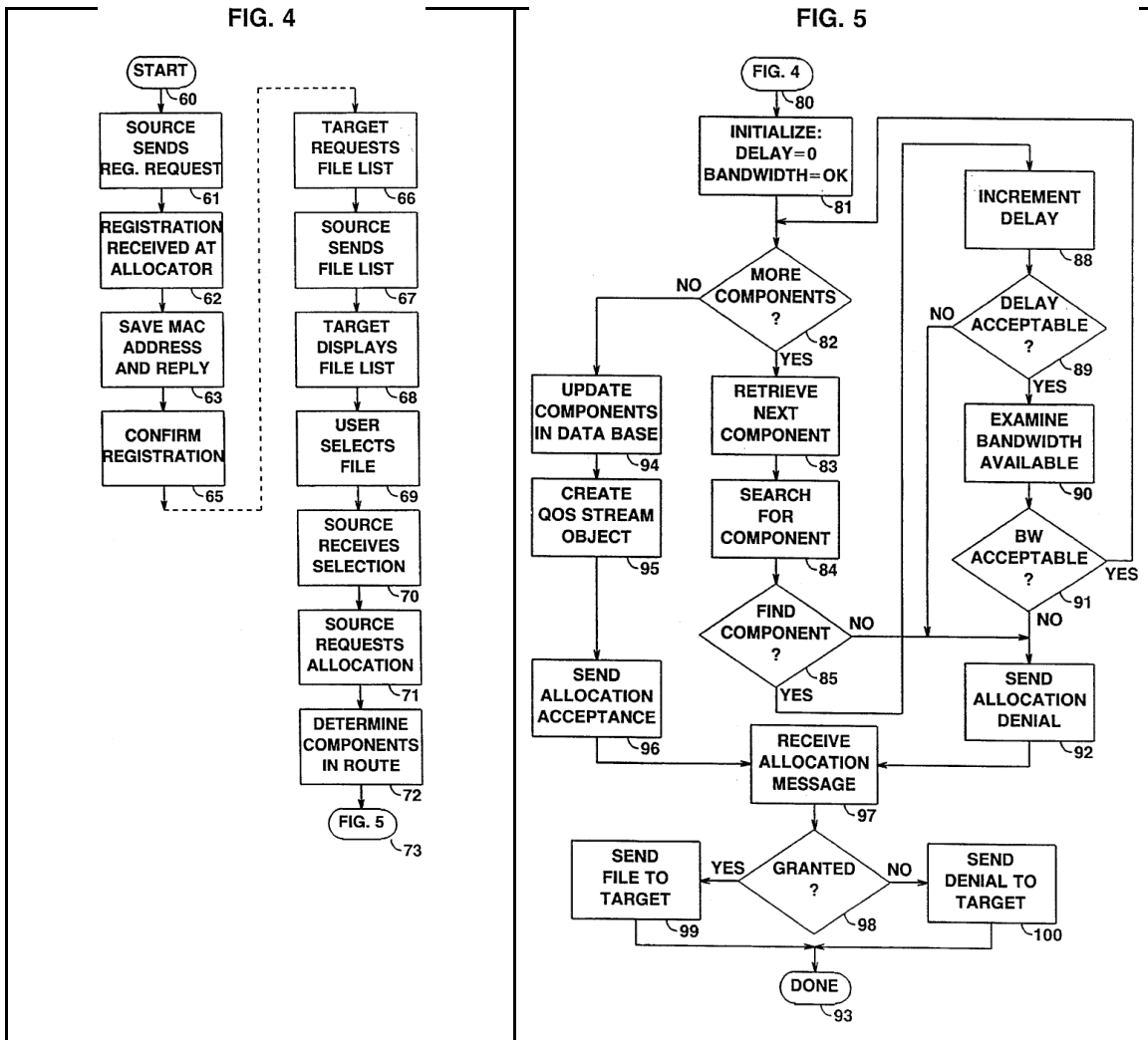
Ex. 1006, 5:51–6:28.

Further, referencing Figure 1, Drake describes “various messages exchanged between the stations of” LAN 17 including the following messages:

- QoS allocation request (or QoS request);
- QoS allocation reply;
- QoS de-allocation announcement; and
- QoS allocation change request.

Ex. 1006, 8:21–29; *see id.* at 3:14–20, 8:29–9:51.

Drake's Figures 4 and 5 (reproduced below) depict steps for allocating a QoS transmission path:



Figures 4 and 5 “show a flow chart of the process of making a quality of service allocation for a multimedia transmission path between a source station and a target station” through LAN 17 in Figure 1. Ex. 1006, 3:49–52, 10:9–11, Figs. 4–5.

In step 66 in Figure 4, target station 29 “requests a list of the multimedia data files available from source station 10.” Ex. 1006, 10:35–37, Fig. 4. Next, in step 67 source station 10 “sends a list of the available multimedia files to target station 29.” *Id.* at 10:37–38, Fig. 4. After target

station 29 selects a multimedia file and sends the selection to source station 10, in step 71 source station 10 sends a request to QoS allocator 20 “to determine if the QoS parameters required for the data stream is available on the transmission path between source station 10 and target station 29.” *Id.* at 10:39–46, Fig. 4. Then, in step 72 QoS allocator 20 uses the path information “to determine if the QoS is available in the components in the multimedia transmission path.” *Id.* at 10:46–49, Fig. 4.

Steps 81 through 96 in Figure 5 show in detail how QoS allocator 20 determines if the QoS is available in the components in the multimedia transmission path. *See* Ex. 1006, 10:52–11:41, Fig. 5.

3. INDEPENDENT CLAIM 10

(a) Preamble 10.pre.1, 10.pre.2, and 10.pre.3

Claim 10’s preamble recites as follows:

[m]ethod for exchanging messages in an integrated circuit comprising a plurality of modules, the messages between the modules being exchanged over connections via a network, wherein said connections comprises [sic] a set of communication channels each having a set of connection properties, any communication channel being independently configurable, wherein said connection through the network supports transactions comprising at least one of outgoing messages from the first module to the second module and return messages from the second module to the first module.

Ex. 1001, 19:21–30.

(i) Petitioner’s Contentions

Petitioner contends that Goossens2002 alone teaches claim 10’s preamble and that the combined disclosures in Goossens2002 and Drake teach claim 10’s preamble. *See* Pet. 19–21, 24–30, 42–44. Specifically, Petitioner asserts that Goossens2002 discloses:

- (1) “a system on silicon (i.e., integrated circuit) in which multiple intellectual property blocks (i.e., modules) communicate with one another over connections via a ‘network on silicon’”;
- (2) connections enabling “two-way communications between the processing modules over one-way channels,” i.e., “one that provides a communication pathway in a forward direction (e.g., an output channel) and another that provides a communication pathway in a reverse direction (e.g., an input channel)”;
- (3) each one-way channel “has certain connection properties,” e.g., “a combined throughput and latency guarantee (GT)” or “best effort (BE), with an unspecified finite latency upper bound”; and
- (4) connections supporting “outgoing messages from a first to a second IP and return messages from the second to the first IP.”

Pet. 26–27, 30, 43 (alteration by Petitioner) (emphases omitted) (quoting Ex. 1005, 2–3).

According to Petitioner, an ordinarily skilled artisan would have understood that the connection properties for the channels in Goossens2002 are adjustable independently. Pet. 28 (citing Ex. 1003 ¶¶ 103–105). Petitioner explains that “one such channel (e.g., the output channel) may be ‘best effort (BE), with an unspecified finite latency upper bound,’ while another (e.g., the input channel) may ‘have a combined throughput and latency guarantee (GT).’” *Id.* (emphases omitted) (quoting Ex. 1005, 3) (citing Ex. 1003 ¶¶ 103–105).

Additionally, Petitioner contends that Drake discloses “two different channels: one in the ‘forward direction,’ for communications ‘from source station 10 to target station 29,’ and a second in the ‘backward direction,’ for

communications ‘from the target station 29 to the source station 10.’”

Pet. 28 (quoting Ex. 1006, 5:34–39). Petitioner contends that Drake also discloses that “each of these channels has separately specified requirements for ‘throughput’ and ‘end-to-end delay’ (i.e., latency)—the same connection properties described by Goossens2002.” *Id.* at 28–29 (emphasis omitted) (quoting Ex. 1006, 5:34–47).

Further, Petitioner asserts that an ordinarily skilled artisan “would have understood that, because the properties are separately specified for each directional channel” in Drake, “these channels can be configured to have different properties,” e.g., throughput/bandwidth and delay/latency, such that “they are ‘adjustable independently.’” Pet. 29–30 (citing Ex. 1003 ¶¶ 108–110; Ex. 1006, 2:61–63, 5:8–14, 8:31–35, 9:60–62, 10:41–51).

(ii) Patent Owner’s Contentions

Patent Owner contends that claim 10’s preamble limits the claim. Prelim. Resp. 18. Patent Owner notes that the parties in both the Samsung litigation and the Qualcomm litigation agreed that claim 10’s preamble limits the claim. *Id.* (citing Ex. 2022, 58; Ex. 2033, 6; Ex. 2052, 2).^{11,12}

Patent Owner disputes that Goossens2002 and Drake teach claim 10’s preamble. Prelim. Resp. 41–42, 46–49. Specifically, Patent Owner asserts that the references do not disclose or render obvious (1) “said connections comprise[] a set of communication channels” and (2) “any communication

¹¹ For Exhibit 2033 (Local Patent Rule 4-3 Joint Claim Construction and Prehearing Statement), we cite to the page numbers that Patent Owner applied to the exhibit, which are the same as the header page numbers.

¹² Patent Owner did not file an exhibit identified as Exhibit 2052.

channel being independently configurable” according to claim 10’s preamble. *Id.* at 46–49.

Regarding “said connections comprise[] a set of communication channels,” Patent Owner contends that “Drake never describes the forward or backward direction as a ‘channel’ in a data stream (connection).” Prelim. Resp. 49 (citing Ex. 1006, 5:30–34; Ex. 2001 ¶ 133). According to Patent Owner, “Drake’s references to ‘forward direction’ and ‘backward direction’ parameters do not suggest that a data stream (connection) can be partitioned into a set of channels.” *Id.* (citing Ex. 2001 ¶ 133).

Regarding “any communication channel being independently configurable,” Patent Owner contends that “nowhere does Goossens2002 expressly disclose that channels are independently configurable.” Prelim. Resp. 48. Patent Owner also contends that Petitioner provides “no explanation” why an ordinarily skilled artisan would have understood that the connection properties for the channels in Goossens2002 are adjustable independently. *Id.* (citing Pet. 28).

(iii) Analysis

Generally, a preamble does not limit a claim. *Allen Eng’g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1346 (Fed. Cir. 2002). We need not decide whether claim 10’s preamble limits the claim because, based on the current record, Petitioner establishes sufficiently that Goossens2002 alone teaches claim 10’s preamble and that the combined disclosures in Goossens2002 and Drake teach claim 10’s preamble. *See* Pet. 19–21, 24–30, 42–44; Ex. 1003 ¶¶ 84–89, 95–112, 138–140.

Based on the current record and for the reasons stated by Petitioner and supported by Dr. Mowry’s testimony, Petitioner establishes sufficiently

that Goossens2002 teaches the undisputed aspects of claim 10's preamble.
See Pet. 19–21, 24–26, 30, 42–44; Ex. 1003 ¶¶ 84–89, 95, 97, 111–112, 138, 140.

Additionally, Goossens2002 discloses the following:

- (1) a system on silicon (SOS) based on the “intellectual-property block (IP) re-use model” containing “hundreds of IPs”;
- (2) a network on silicon (NOS) for communication between the IPs;
- (3) the IPs interacting by “message passing”;
- (4) an NOS supporting “both guaranteed and best-effort services”;
- (5) the services include “uncorrupted transmission, lossless transmission, in-order delivery, throughput, jitter (delay variation), and latency”;
- (6) a “channel implements a simplex point-to-point communication between two network interfaces”;
- (7) a “connection combines multiple channels”;
- (8) the connections include “full duplex” connections; and
- (9) a “channel can have a combined throughput and latency guarantee (GT), or be best effort (BE), with an unspecified finite latency upper bound.”

Ex. 1005, 1–3; *see* Ex. 1003 ¶¶ 64–65, 84–89, 101–103.

Regarding “said connections comprise[] a set of communication channels,” the following disclosures in Goossens2002 teach that aspect of claim 10's preamble:

- (1) a “channel implements a simplex point-to-point communication between two network interfaces”;
- (2) a “connection combines multiple channels”; and

(3) the connections include “full duplex” connections.

Ex. 1003 ¶ 100. An ordinarily skilled artisan would have understood that a “full duplex” connection has “two separate and independent channels, e.g., for simultaneous transmission and reception of packets,” and thus permits “communications in two directions.” *Id.* ¶¶ 100, 112.

Regarding “any communication channel being independently configurable,” the following disclosure in Goossens2002 teaches that aspect of claim 10’s preamble: a “channel can have a combined throughput and latency guarantee (GT), or be best effort (BE), with an unspecified finite latency upper bound.” Ex. 1003 ¶¶ 101–103, 139. The ’449 patent explains that “connection properties” include, among other things, “throughput (a lower bound on throughput is guaranteed)” and “latency (upper bound for latency is guaranteed).” Ex. 1001, 8:62–9:3; *see id.* at 9:51–65. Goossens2002 discloses “throughput” and “latency” as “connection properties.” Ex. 1005, 3; *see* Ex. 1003 ¶¶ 64, 101.

Based on Goossens2002’s disclosure that a “channel can have a combined throughput and latency guarantee (GT), or be best effort (BE), with an unspecified finite latency upper bound,” an ordinarily skilled artisan would have understood that one channel is “independently configurable” for “a combined throughput and latency guarantee (GT)” and that another channel is “independently configurable” for “best effort (BE), with an unspecified finite latency upper bound.” Ex. 1003 ¶ 103; Ex. 1005, 3. Petitioner quotes that disclosure in Goossens2002 when explaining what an ordinarily skilled artisan would have understood. Pet. 28 (quoting Ex. 1005, 3). Accordingly, we disagree with Patent Owner that Petitioner provides “no explanation” why an ordinarily skilled artisan would have

understood that the connection properties for the channels in Goossens2002 are adjustable independently. *See* Prelim. Resp. 48.

Regarding “said connections comprise[] a set of communication channels,” Drake discloses that a data stream traverses a transmission path (connection path) from a source station to a target station. *See* Ex. 1006, 2:47–54, 4:26–37, 4:50–55, 5:8–14, 5:25–30, 7:46–8:5, 10:9–11, 10:42–46, 12:35–39. Drake also discloses that a transmission path may have separate QoS parameters in the forward and backward directions corresponding to separate channels in the forward and backward directions. *Id.* at 5:30–50; *see id.* at 6:24–28; Ex. 1003 ¶¶ 106–107. For instance, Drake identifies the following QoS parameters as separate service parameters in the forward and backward directions on a transmission path:

- Throughput—Forward Direction;
- Throughput—Backward Direction;
- End-to-End Delay—Forward Direction; and
- End-to-End Delay—Backward Direction.

Ex. 1006, 5:30–47; *see id.* at 6:24–28; Ex. 1003 ¶ 107.

In addition to separate QoS parameters in the forward and backward directions on a transmission path, Drake discloses the following traffic descriptors indicating the “type of service,” e.g., “access priority, synchronous, asynchronous, etc.,” in the forward and backward directions on a transmission path:

- Access Class—Forward Direction; and
- Access Class—Backward Direction.

Ex. 1006, 5:51–6:28; *see* Ex. 1003 ¶ 109. In view of these traffic descriptors, an ordinarily skilled artisan would have understood that the

“types of communications being transmitted over the two directional channels can differ substantially, necessitating different QoS guarantees.” Ex. 1003 ¶ 109.

Additionally, Drake discloses changing separate QoS parameters in the forward and backward directions for “an already existing transmission path allocation.” Ex. 1006, 12:35–42, 13:9–15; *see* Ex. 1003 ¶ 107. As an example, QoS allocator 20 may increase the bandwidth for “an already existing transmission path allocation” if “the transmission changes from a one-way Client/Server transmission to a two-way Client/Client interactive transmission.” Ex. 1006, 12:35–42. As another example, QoS allocator 20 may decrease the bandwidth for “a previously granted transmission path allocation” to “accommodate a change to a one-way transmission from a two-way transmission.” *Id.* at 13:9–15.

Hence, Drake discloses that a data stream traverses a transmission path (connection path) that may have separate QoS parameters in the forward and backward directions corresponding to separate channels in the forward and backward directions. Accordingly, based on the current record, we disagree with Patent Owner that “Drake’s references to ‘forward direction’ and ‘backward direction’ parameters do not suggest that a data stream (connection) can be partitioned into a set of channels.” *See* Prelim. Resp. 49.

Regarding “any communication channel being independently configurable,” Drake discloses separate QoS parameters in the forward and backward directions, such as Throughput—Forward Direction, Throughput—Backward Direction, End-to-End Delay—Forward Direction, and End-to-End Delay—Backward Direction. Ex. 1006, 5:30–50; *see id.*

at 6:24–28; Ex. 1003 ¶¶ 106–107. The QoS management system determines the QoS parameters “statically” or “dynamically” and may adjust the QoS parameters after their initial allocation. Ex. 1006, 2:32–34, 12:35–42, 13:9–15; *see* Ex. 1003 ¶ 107.

(b) Limitations 10.a and 10.b

Claim 10 recites “the first module issuing a request for a connection with the second module to a communication manager, wherein the request comprises desired connection properties associated with the sets of communication channels.” Ex. 1001, 19:32–35 (limitation 10.a). Claim 10 also recites “the communication manager forwarding the request to a resource manager.” *Id.* at 19:36–37 (limitation 10.b).

(i) Petitioner’s Contentions

a. Limitation 10.a

Petitioner contends that the combined disclosures in Goossens2002 and Drake teach limitation 10.a. *See* Pet. 32–35, 37–38, 44. Specifically, Petitioner asserts that Drake discloses the claimed “communication manager” because Drake’s QoS management system includes a QoS requestor manager that:

- (1) is “associated with” a source station;
- (2) manages communications between modules by “assembl[ing] a request to reserve a QoS connection for a multi-media data stream . . . between source station 10 and target station 29”;
- (3) forwards a request to reserve a QoS connection to a QoS allocator;
- (4) may accept or reject connections established by the QoS allocator based on the specified QoS parameters; and

- (5) may request the release of reserved connections and resources.

Id. at 32–34 (alterations by Petitioner) (quoting Ex. 1006, 4:35–37); *see id.* at 38. Petitioner also asserts that “a QoS requestor manager associated with the QoS allocator ‘receives, decodes and acts upon the QoS request from source station 10.’” *Id.* at 34 (quoting Ex. 1006, 5:6–8).

As support for its assertions, Petitioner provides a highlighted and annotated version of Drake’s Figure 1 as reproduced below (Pet. 34):

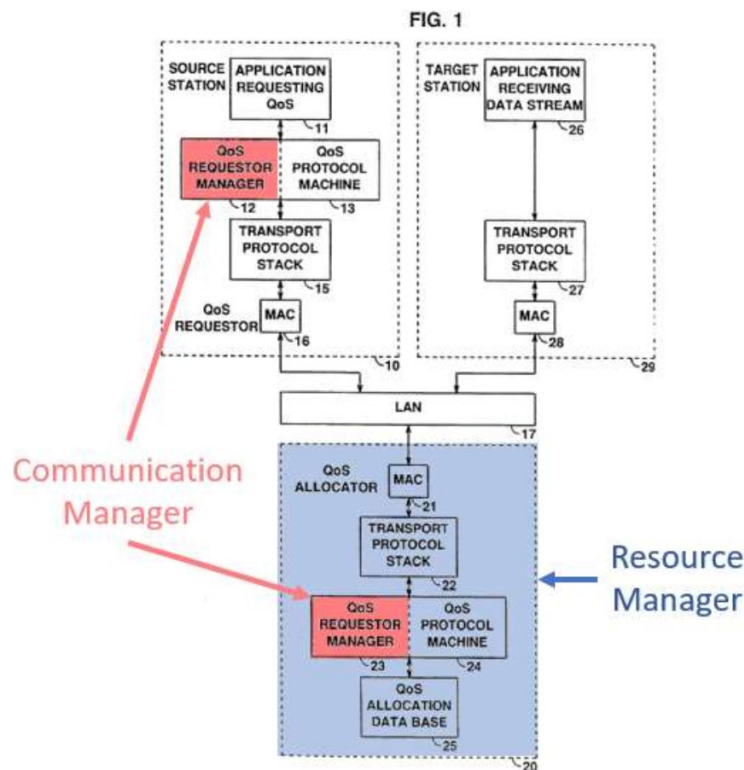


Figure 1 depicts a QoS management system. Ex. 1006, 3:36–40, Fig. 1. The above highlighted and annotated version of Figure 1 includes:

- (1) red highlighting over QoS requestor manager 12 in source station 10;
- (2) red highlighting over QoS requestor manager 23 in QoS allocator 20;

- (3) blue highlighting over the other components in QoS allocator 20;
- (4) the red annotation “Communication Manager” identifying both QoS requestor manager 12 in source station 10 and QoS requestor manager 23 in QoS allocator 20; and
- (5) the blue annotation “Resource Manager” identifying QoS allocator 20.

See Pet. 34; Ex. 1003 ¶ 121.

Despite the highlighting and annotations in this version of Figure 1, Petitioner explains that (1) QoS requestor manager 12 in source station 10 corresponds to the claimed “communication manager” and (2) QoS allocator 20 corresponds to the claimed “resource manager.” Prelim. Reply 6–7; *see* Pet. 22–25, 32–33, 38–39, 46–47.

Further, regarding limitation 10.a’s requirement that “the request comprises desired connection properties associated with the sets of communication channels,” Petitioner contends that Goossens2002 discloses that IPs “can set up and remove connections” by making a “service request” for a connection containing information about the connection’s performance requirements. Pet. 37 (citing Ex. 1005, 2–3). Petitioner identifies the IP making a “service request” for a connection as the claimed “first module” and the destination or target IP as the claimed “second module.” *Id.* (citing Ex. 1003 ¶ 128). Petitioner asserts that Drake similarly discloses that “an application in a source station (i.e., first module) ‘requests a QoS connection to the destination or target station’ (i.e., second module).” *Id.* (emphases omitted) (quoting Ex. 1006, 4:29–30) (citing Ex. 1006, 2:32–41, 4:26–29, 5:25–50, code (57)).

Petitioner asserts that an ordinarily skilled artisan “would have understood from these disclosures that the requests described by Goossens2002 and Drake include desired connection properties.” Pet. 37 (citing Ex. 1003 ¶ 129).

b. Limitation 10.b

Petitioner contends that the combined disclosures in Goossens2002 and Drake teach limitation 10.b. *See* Pet. 22–24, 28–29, 38–39, 44. Specifically, Petitioner asserts that Goossens2002 discloses the claimed “resource manager” because Goossens2002’s NOS includes a “quality-of-service manager” that can “observe and steer” the NOS. *Id.* at 22 (quoting Ex. 1005, 3). Petitioner asserts that an ordinarily skilled artisan would have recognized that the “quality-of-service manager” is “a circuit” and “its functionality involves managing resources of the network.” *Id.* (citing Ex. 1003 ¶ 90).

Additionally, Petitioner asserts that Drake discloses the claimed “resource manager” because Drake’s QoS management system includes QoS allocator 20 that “receives requests for connections with certain properties and examines the resources of the network to determine whether those requests can be satisfied.” Pet. 22 (citing Ex. 1003 ¶ 91; Ex. 1006, 2:14–21, 2:65–3:6, 4:22–25, 4:49–54, 4:66–5:14, 10:41–11:48, code (57), Fig. 1). As support for its assertion, Petitioner provides a highlighted and annotated version of Drake’s Figure 1 as reproduced below (Pet. 24):

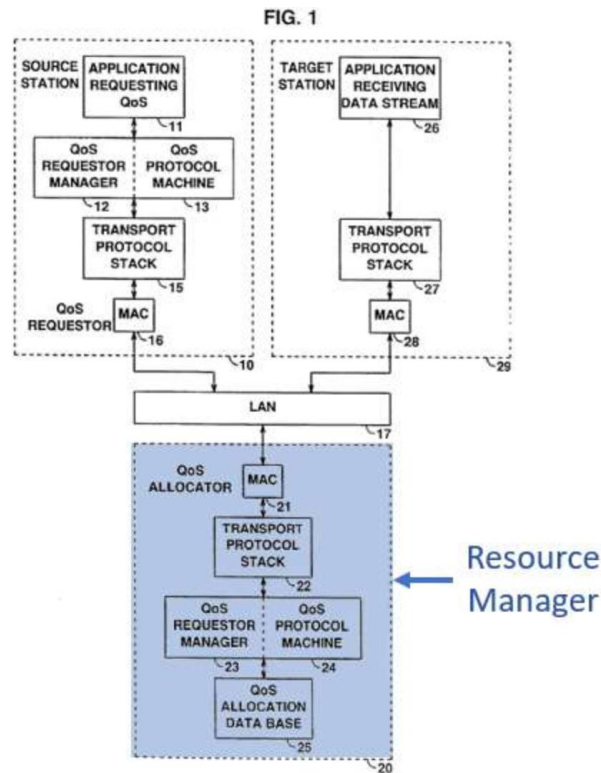


Figure 1 depicts a QoS management system. Ex. 1006, 3:36–40, Fig. 1. The above highlighted and annotated version of Figure 1 includes (1) blue highlighting over QoS allocator 20 and (2) the blue annotation “Resource Manager” identifying QoS allocator 20. See Pet. 24; Ex. 1003 ¶ 93.

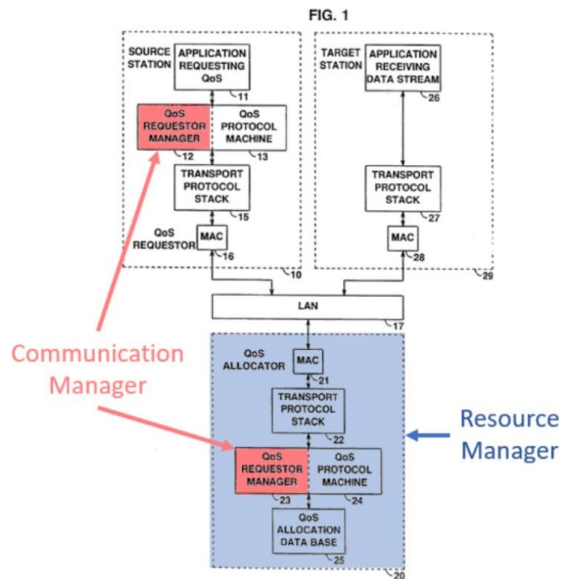
Petitioner asserts that QoS requestor manager 12 in source station 10 (the claimed “communication manager”) “assemble[s] a request to reserve a QoS connection” using QoS protocol machine 13 in source station 10 to format the QoS request (also called a QoS allocation request). Pet. 38 (alteration by Petitioner) (quoting Ex. 1006, 4:35). Petitioner asserts that the QoS request concerns “communication channels each having a specific set of connection properties,” i.e., “separately specified requirements for ‘throughput’ and ‘end-to-end delay’ (i.e., latency)—the same connection properties described by Goossens2002.” *Id.* at 28, 39 (emphasis omitted).

Petitioner also asserts that the QoS request is sent to QoS allocator 20 (the claimed “resource manager”). *Id.* at 39.

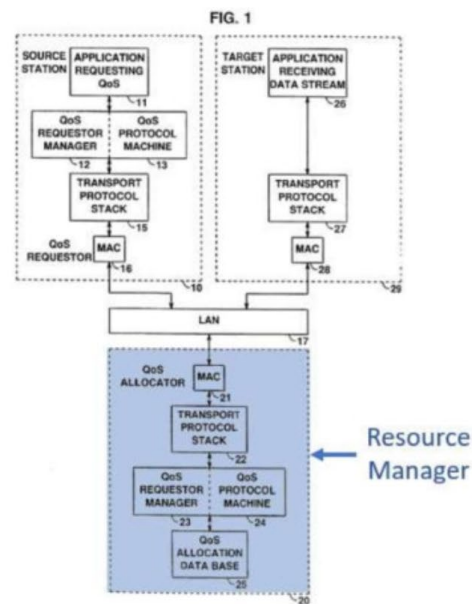
(ii) Patent Owner’s Contentions

Patent Owner disputes that the combined disclosures in Goossens2002 and Drake teach limitations 10.a and 10.b. *See* Prelim. Resp. 43–46; Prelim. Sur-reply 5–6. In particular, Patent Owner contends that claim 10 requires a “communication manager” and a “resource manager” that are “separate and distinct.” Prelim. Resp. 14–15, 46. Patent Owner contends that Goossens2002 does not disclose the “communication manager” or the “resource manager” required by claim 10. *Id.* at 42–43.

Patent Owner also contends that Petitioner fails to identify “separate and distinct” structures in Drake for the “communication manager” and the “resource manager.” Prelim. Resp. 43–46; Prelim. Sur-reply 5–6. As support for its contention, Patent Owner provides the following side-by-side comparison of Drake’s Figure 1 as highlighted and annotated by Petitioner on different pages of the Petition (Prelim. Resp. 46; Prelim. Sur-reply 6):



Petition, 34



Petition, 24

Above on the left, the highlighted and annotated version of Figure 1 from Petition page 34 identifies both QoS requestor manager 12 in source station 10 and QoS requestor manager 23 in QoS allocator 20 as the “Communication Manager” and identifies the other components in QoS allocator 20 as the “Resource Manager.” *See* Pet. 34; Prelim. Resp. 46; Prelim. Sur-reply 6. Above on the right, the highlighted and annotated version of Figure 1 from Petition page 24 identifies all of the components in QoS allocator 20 as the “Resource Manager.” *See* Pet. 24; Prelim. Resp. 46; Prelim. Sur-reply 6.

Patent Owner asserts that “[i]f the entire QoS allocator 20 (the alleged resource manager) and the QoS requestor manager 23 (the alleged communication manager) is part of the QoS allocator 20, then the alleged resource and communication managers are not separate and distinct as required by the claims.” Prelim. Sur-reply 6 (emphasis omitted).

Further, regarding limitation 10.a's requirement that "the request comprises desired connection properties associated with the sets of communication channels," Patent Owner contends that Drake's QoS allocation request concerns "an allocation of a QoS path for a particular data stream" and "only applies to a single data stream (i.e., a connection)." Prelim. Resp. 50 (emphasis omitted) (quoting Ex. 1006, 8:31–32). Patent Owner contends that "Drake does not disclose a single allocation request comprising QoS parameters for both an alleged forward channel (e.g., forward data stream) and an alleged backward channel (e.g., backward data stream)." *Id.* at 51. According to Patent Owner, "Drake's system would need to issue two requests: one for each data flow (connection)." *Id.* (citing Ex. 2001 ¶ 132).

(iii) Analysis

Based on the current record, Petitioner establishes sufficiently that the combined disclosures in Goossens2002 and Drake teach limitations 10.a and 10.b. *See* Pet. 22–24, 28–29, 32–35, 37–39, 44; Prelim. Reply 6–7; Ex. 1003 ¶¶ 91–93, 99–103, 106–110, 118–120, 128–132, 141–142. Specifically, Drake discloses a QoS management system including source station 10, QoS allocator 20, and target station 29 connected to one another by LAN 17. Ex. 1006, 3:36–40, 4:18–26, Fig. 1; *see* Ex. 1003 ¶¶ 67, 78.

Source station 10 includes application 11, QoS requestor manager 12, and QoS protocol machine 13. Ex. 1006, 4:27–34, Fig. 1; *see* Ex. 1003 ¶ 67. Application 11 "requests a QoS connection to the destination or target station 29." Ex. 1006, 4:27–30; *see* Ex. 1003 ¶ 97. Together, QoS requestor manager 12 and QoS protocol machine 13 "assemble a request to reserve a QoS connection for a multi-media data stream on [a] path through the

LAN 17 between source station 10 and target station 29.” Ex. 1006, 4:34–37; *see* Ex. 1003 ¶¶ 67, 118. More particularly, “QoS requestor manager 12 interacts with application 11 using internal messages as is well known in the art and utilizes QoS protocol machine 13 to format the QoS request.” Ex. 1006, 4:62–65; *see* Ex. 1003 ¶ 130.

QoS allocator 20 “receive[s] the QoS request from station 10, examine[s] the resources of LAN 17, and determine[s] if a path exists in LAN 17 between station 10 and station 29 which satisfies the requested level of QoS.” Ex. 1006, 4:50–54; *see* Ex. 1003 ¶¶ 67, 91, 131. “If the QoS exists, it is assigned to this QoS data stream.” Ex. 1006, 4:54–55. “If the QoS is not available, station 10 is notified of the lack of an adequate QoS path to the intended destination.” *Id.* at 4:55–57. QoS allocator 20 “manages the QoS requests for the entire LAN 17.” *Id.* at 4:66–67; *see id.* at code (57).

As Petitioner explains, QoS requestor manager 12 in source station 10 corresponds to the claimed “communication manager,” and QoS allocator 20 corresponds to the claimed “resource manager.” *See* Pet. 22–25, 32–33, 38–39, 46–47; Prelim. Reply 6–7; Ex. 1003 ¶¶ 91–93, 96, 118–119, 130–131. Although the highlighted and annotated version of Drake’s Figure 1 on Petition page 34 identifies both QoS requestor manager 12 in source station 10 and QoS requestor manager 23 in QoS allocator 20 as the “communication manager,” Petitioner’s arguments clarify that the “communication manager” does not include QoS requestor manager 23 in QoS allocator 20. *See* Pet. 16, 32–33, 38–39, 49; Prelim. Reply 6–7.

As an example, Petitioner argues that Drake discloses “QoS requestor managers associated with source stations,” like QoS requestor manager 12 in

source station 10, that manage communications between modules and send QoS requests to “the QoS allocator (i.e., resource manager).” Pet. 33 (emphasis omitted). As another example, Petitioner argues that “the application in the source station (i.e., first module)” communicates a QoS request to “a QoS requestor manager (i.e., communication manager)” in the source station for “subsequent transmission to a QoS allocator” separate from the source station. *Id.* at 38 (emphases omitted).

As yet another example, Petitioner argues that an ordinarily skilled artisan “would have looked to Drake’s disclosure of a ‘QoS requestor manager’ to formulate requests for guaranteed services with particular properties” like the claimed “communication manager.” Pet. 16, 49; *see* Ex. 1001, 10:19–24. In Drake’s QoS management system, QoS requestor manager 12 in source station 10 “formulate[s] requests for guaranteed services with particular properties,” and QoS requestor manager 23 in QoS allocator 20 does not do so. *See* Ex. 1006, 4:34–37, 4:62–65, 5:5–8.

Hence, we disagree with Patent Owner that Petitioner fails to identify “separate and distinct” structures in Drake for the “communication manager” and the “resource manager.” *See* Prelim. Resp. 43–46; Prelim. Sur-reply 5–6. Moreover, based on the current record, we see nothing preventing the “communication manager” and the “resource manager” from sharing some common components. *See Linear Tech. Corp. v. Int’l Trade Comm’n*, 566 F.3d 1049, 1055 (Fed. Cir. 2009) (deciding that a “second circuit” and a “third circuit” could share some common components).

Further, regarding limitation 10.a’s requirement that “the request comprises desired connection properties associated with the sets of communication channels,” Goossens2002 discloses that “some IPs have

inherent performance requirements, such as a minimum throughput (for real-time streaming data), or bounded latency (for interrupts).” Ex. 1005, 2; *see* Ex. 1003 ¶ 64. Goossens2002 also discloses that IPs “can set up and remove connections” by making a “service request” for a connection containing information about the connection’s performance requirements. Ex. 1005, 2–3; *see* Ex. 1003 ¶ 128. An ordinarily skilled artisan would have understood that the service requests described by Goossens2002 include “desired connection properties associated with the sets of communication channels” according to limitation 10.a. Ex. 1003 ¶ 129.

(d) Limitation 10.c

Claim 10 recites “the resource manager determining whether a target connection with the desired connection properties is available.” Ex. 1001, 19:38–40 (limitation 10.c).

Petitioner contends that the combined disclosures in Goossens2002 and Drake teach limitation 10.c. *See* Pet. 31–32, 44. Specifically, Petitioner asserts that Drake’s QoS allocator 20 receives a QoS request and then “examines the network resources to ‘determine if the QoS parameters required for the data stream is available,’ i.e., whether the connection properties are available such that the requested connection can be established.” *Id.* at 31 (emphasis omitted) (quoting Ex. 1006, 10:44–45). Petitioner also asserts that QoS allocator 20 “determine[s] if the QoS is available in the components in the multimedia transmission path” using a database containing “information regarding the components of the network and the resources reserved by previously allocated connections.” *Id.* at 32 (alteration by Petitioner) (quoting Ex. 1006, 10:47–49).

According to Petitioner, “Drake describes the QoS allocator’s process for determining the availability of the requested connection properties by reference to Figures 4 and 5.” Pet. 31 (citing Ex. 1003 ¶ 114; Ex. 1006, 10:9–11:48, Figs. 4–5).

At this stage of the proceeding, Patent Owner makes no arguments specific to limitation 10.c. *See, e.g.*, Prelim. Resp. 41–56; Prelim. Sur-reply 5–6. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

Based on the current record and for the reasons stated by Petitioner and supported by Dr. Mowry’s testimony, Petitioner establishes sufficiently that the combined disclosures in Goossens2002 and Drake teach limitation 10.c. *See* Pet. 31–32, 44; Ex. 1003 ¶¶ 113–116, 143.

(e) Limitation 10.d

Claim 10 recites “the resource manager responding with the availability of the target connection to the communication manager.” Ex. 1001, 20:1–2 (limitation 10.d).

Petitioner contends that the combined disclosures in Goossens2002 and Drake teach limitation 10.d. *See* Pet. 40, 45. Specifically, Petitioner asserts that Drake’s QoS allocator 20 receives a QoS request and then “examines the resources of the network to ‘determine if the QoS parameters required for the data stream is available,’ i.e., whether a connection with the requested connection properties is available to be established.” *Id.* at 40 (emphasis omitted) (quoting Ex. 1006, 10:44–45). Petitioner asserts that after QoS allocator 20 “has made its determination, it sends a ‘QoS allocation reply,’ which indicates, among other things, whether the requested

connection and connection properties are available.” *Id.* (citing Ex. 1006, 4:55–57, 8:20–29, 8:50–64, Fig. 5).

At this stage of the proceeding, Patent Owner makes no arguments specific to limitation 10.d. *See, e.g.*, Prelim. Resp. 41–56; Prelim. Sur-reply 5–6. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on the current record and for the reasons stated by Petitioner and supported by Dr. Mowry’s testimony, Petitioner establishes sufficiently that the combined disclosures in Goossens2002 and Drake teach limitation 10.d. *See* Pet. 40, 45; Ex. 1003 ¶¶ 133, 144.

(f) Limitation 10.e

Claim 10 recites “the target connection between the first and second module being established based on the available properties of said communication channels of said connection.” Ex. 1001, 20:4–6 (limitation 10.e).

Petitioner contends that the combined disclosures in Goossens2002 and Drake teach limitation 10.e. *See* Pet. 41–42, 45. Specifically, Petitioner asserts that if Drake’s QoS allocator 20 “determines that the requested QoS properties are available, the requested connection between the source and target stations is established along a designated path through the network and required resources are reserved.” *Id.* at 41 (citing Ex. 1006, 10:9–11, 11:17–19, 11:26–28, code (57), Fig. 5). Petitioner asserts that “[t]his newly established connection is identified and described in the ‘QoS allocation reply’ message by a ‘StreamID,’ ‘Route Designator Fields,’ and an identification of the ‘QoS parameters of the path granted’ to the connection.” *Id.* (quoting Ex. 1006, 8:50–62). Petitioner also asserts that “the database is

updated to reflect the resources that have been reserved for the newly established connection, and are therefore unavailable for future connection allocations.” *Id.* at 41–42 (citing Ex. 1006, 11:11–17, Fig. 5).

At this stage of the proceeding, Patent Owner makes no arguments specific to limitation 10.e. *See, e.g.*, Prelim. Resp. 41–56; Prelim. Sur-reply 5–6. Nonetheless, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

Based on the current record and for the reasons stated by Petitioner and supported by Dr. Mowry’s testimony, Petitioner establishes sufficiently that the combined disclosures in Goossens2002 and Drake teach limitation 10.e. *See* Pet. 41–42, 45; Ex. 1003 ¶¶ 134, 145.

(g) Alleged Reason to Combine the Teachings of the References

Petitioner identifies a reason that would have prompted an ordinarily skilled artisan to combine Drake’s teachings with Goossens2002’s teachings in the way Petitioner proposes, i.e., “to create an SoC with improved performance and efficiency.” *See* Pet. 15–19. Further, Petitioner asserts that an ordinarily skilled artisan would have had “a reasonable expectation of success” in combining the teachings of the references. *Id.* at 17.

Dr. Mowry’s testimony supports Petitioner’s positions. *See* Ex. 1003 ¶¶ 33, 72–82, 94, 96.

For instance, Dr. Mowry testifies that “Goossens2002 does not include certain details regarding the implementation of its guaranteed services and connections,” such as (1) how connection requests are formulated, (2) where connection requests are sent, and (3) how a quality-of-service manager determines “whether to accept or reject requests for guaranteed services.” Ex. 1003 ¶ 75. Dr. Mowry also testifies that “Drake

provides details regarding the implementation of these features” that an ordinarily skilled artisan would have found “helpful in implementing an SoC like the one described by Goossens2002.” *Id.* ¶ 76 (citing Ex. 1006, code (57)).

Dr. Mowry explains that an ordinarily skilled artisan “would have understood that using Drake’s quality of service management process” with Goossens2002’s network on silicon:

- (1) “would improve the performance of Goossens2002’s network on silicon by ensuring that the network resources required to provide guaranteed services are actually available” and allowing the network “to fulfill its commitments to the IPs that have been granted such services”; and
- (2) “would improve the efficiency of Goossens2002’s network on silicon by allowing IP blocks to reserve only those resources that they actually need.”

Ex. 1003 ¶ 79. According to Dr. Mowry, an ordinarily skilled artisan “would have been particularly interested in Drake’s disclosure of a ‘QoS requestor manager’ to formulate requests for guaranteed services with particular properties and a ‘QoS allocator’ to determine whether the network resources required for the requested services are available.” *Id.* ¶ 76 (citing Ex. 1006, 2:14–40, 4:17–56).

Additionally, Dr. Mowry testifies that “while Drake describes its QoS management system in the context of local area networks,” an ordinarily skilled artisan “would have recognized that the advantages and benefits of Drake’s system are applicable to a network on silicon like the one described by Goossens2002.” Ex. 1003 ¶ 81. Dr. Mowry also testifies that an ordinarily skilled artisan would have understood “the parallels between mature off-chip networks and newer on-chip networks.” *Id.* ¶ 82.

Dr. Mowry explains that “NoCs have borrowed many design features from scalable interconnection networks that were designed for large-scale parallel machines in the 1990s.” Ex. 1003 ¶¶ 33, 82 (citing Ex. 1010, 277; Ex. 1013, vii–viii; Ex. 1014, 86–95; Ex. 1015, 749–828).^{13,14,15,16} As support, Dr. Mowry quotes the following statements from the book titled “Networks on Chip” edited by Axel Jantsch and Hannu Tenhunen (Kluwer Academic Publishers 2003):

- “Designing a network for on-chip communication is similar to the problem of designing a local area computer network with some computing and communication requirements.”
- “The resource allocation, optimization of network usage and verification of performance and correctness are the main problems that are basically similar to what distributed and parallel system designers have to face.”

¹³ Exhibit 1010 (a paper by Andrei Rădulescu, Kees Goossens, and others from Philips Research Laboratories) includes only pages 1–6 and appears to lack the cited material. But Exhibit 2029 (Samsung’s First Amended Answer and Counterclaims to Plaintiff’s Complaint) includes as Exhibit H a book chapter by Andrei Rădulescu and Kees Goossens containing the cited material on page 277.

¹⁴ For Exhibit 1013 (José Duato et al., *Interconnection Networks: An Engineering Approach*, IEEE Computer Society Press (1998)), we cite to the page numbers that appear in the publication.

¹⁵ In Exhibit 1014 (Axel Jantsch & Hannu Tenhunen eds., *Networks on Chip*, Kluwer Academic Publishers (2003)), Petitioner included only pages i–viii and 1–59 of this book.

¹⁶ For Exhibit 1015 (David E. Culler & Jaswinder P. Singh, *Parallel Computer Architecture: A Hardware/Software Approach*, Morgan Kaufmann Publishers, Inc. (1999)), we cite to the page numbers that appear in the publication.

Id. ¶ 82 (quoting Ex. 1014, 33, 102).¹⁷

Patent Owner disputes that an ordinarily skilled artisan would have been motivated to combine Drake’s teachings with Goossens2002’s teachings. *See* Prelim. Resp. 51–55. Specifically, Patent Owner asserts that (1) “Goossens2002 relates to systems on silicon (SoSs) that comprise numerous IP cores” and (2) “Drake does not relate to a NoC.” *Id.* at 52 (citing Ex. 1005, 1; Ex. 2001 ¶ 153). According to Patent Owner, the ’449 patent “explains that on-chip networks like Goossens2002 differ drastically from off-chip networks like Drake.” *Id.* at 53 (citing Ex. 1001, 1:66–2:1; Ex. 2001 ¶ 154). Patent Owner quotes the following statement in the ’449 patent: “NoC’s premises are different from off-chip networks, and, therefore, most of the network design choices must be reevaluated.” *Id.* at 54 (quoting Ex. 1001, 1:66–2:1).

Patent Owner also asserts that an ordinarily skilled artisan would have understood that “the design considerations for on and off chip networks are drastically different” and, therefore, would not have been “motivated to combine the on-chip teachings of Goossens2002 with the off-chip teachings of Drake.” Prelim. Resp. 54 (citing Ex. 2001 ¶ 154).

Additionally, Patent Owner contends that (1) “Drake’s source station 10 corresponds to Goossens2002’s IP block or processing module” and (2) “Drake’s requestor manager 12 concerns the communication network” and is “disposed within the source station 10.” Prelim. Resp. 54–55. Patent Owner contends that modifying Goossens2002’s IP block

¹⁷ In Exhibit 1014, Petitioner included only pages i–viii and 1–59 of this book.

to include Drake's requestor manager 12 conflicts with Goossens2002's teaching to decouple "computation from communication." *Id.*

Based on the current record, and for the reasons explained below, Petitioner establishes sufficiently that an ordinarily skilled artisan would have been motivated to combine Drake's teachings with Goossens2002's teachings in the way Petitioner proposes, i.e., "to create an SoC with improved performance and efficiency." *See* Pet. 15–19; Ex. 1003 ¶¶ 33, 72–82. As Dr. Mowry explains, an ordinarily skilled artisan "would have understood that using Drake's quality of service management process" with Goossens2002's NoC would improve the NoC's performance and efficiency. Ex. 1003 ¶ 79; *see id.* ¶ 81. "There is a motivation to combine when a known technique 'has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way,' using the 'prior art elements according to their established functions.'" *Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1380–81 (Fed. Cir. 2023) (citations omitted) (quoting *KSR*, 550 U.S. at 417; *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 799–800 (Fed. Cir. 2021)).

Based on the current record, and for the reasons explained below, we disagree with Patent Owner that an ordinarily skilled artisan would not have been "motivated to combine the on-chip teachings of Goossens2002 with the off-chip teachings of Drake." *See* Prelim. Resp. 52–54. The '449 patent notes that many issues concerning on-chip networks "have been already the subject of research in the field of local and wide area networks (computer networks)," i.e., off-chip networks. Ex. 1001, 1:56–63. According to the patent, many topics concerning off-chip networks "are very much related to

on-chip networks,” and many of the results off chip “are also applicable on chip.” *Id.* at 1:63–66.

The ’449 patent cautions, however, that differences between off-chip networks and on-chip networks may require “network design choices [to] be reevaluated” and lead “to different design choices.” Ex. 1001, 1:66–2:4. Hence, the patent instructs that design choices for off-chip networks may have direct relevance to on-chip networks or may require reevaluation before implementation. *See id.* at 1:56–2:5.

Consistent with the ’449 patent, a 2003 book chapter by Andrei Rădulescu and Kees Goossens (the named inventors) states as follows:

Networks have been the subject of research for decades, both in the context of local and wide area networks (computer networks), and as an interconnect for parallel machines. Both are very much related to on-chip networks, and many of the results in those fields are also applicable on chip. However, NoC premises are different from off-chip networks, and, therefore, most of the network design choices must be re-evaluated.

Ex. 2029, 50, 177 (citations omitted); *see id.* at 174–99 (Exhibit H: Andrei Rădulescu & Kees Goossens, “Communication Services for Networks on Chip,” *Domain-Specific Processors: Systems, Architectures, Modeling, and Simulation*, 275–99 (2003)). Hence, an ordinarily skilled artisan would not have rejected teachings concerning off-chip networks as irrelevant to on-chip networks.

Instead, due to “the parallels between mature off-chip networks and newer on-chip networks,” an ordinarily skilled artisan would have understood that “[d]esigning a network for on-chip communication is similar to the problem of designing a local area computer network with some

computing and communication requirements.” Ex. 1003 ¶ 82. Drake discloses a QoS management system for local area networks that “ensures selected levels of quality of service to all transmission requests submitted to the management system.” Ex. 1006, code (57); *see id.* at 1:8–11, 2:26–41; Ex. 1003 ¶¶ 66–68.

Moreover, Patent Owner mischaracterizes the proposed modification when contending that modifying Goossens2002’s IP block to include Drake’s requestor manager 12 conflicts with Goossens2002’s teaching to decouple “computation from communication.” *See* Pet. 15–19; Prelim. Resp. 54–55. Goossens2002 discloses (1) a system on silicon (SOS) based on the “intellectual-property block (IP) re-use model” containing “hundreds of IPs” and (2) a network on silicon (NOS) for communication between the IPs. Ex. 1005, 1; *see* Ex. 1003 ¶ 63. Petitioner proposes implementing Drake’s QoS management process in the NOS, not modifying an IP block. *See* Pet. 16–17; Ex. 1003 ¶¶ 78–79, 94, 96. Consistent with this, Drake explains that the QoS management of “a local area network is almost entirely concentrated in a single QoS management station on the LAN.” Ex. 1006, 2:66–3:1.

(h) Preliminary Conclusion About Obviousness/Nonobviousness

As discussed above, Petitioner’s analysis addresses how the combined disclosures in Goossens2002 and Drake teach claim 10’s subject matter. *See supra* §§ IV.E.3(a)–(f). Additionally, Petitioner provides a reason with rational underpinning as to why an ordinarily skilled artisan would have been motivated to combine Drake’s teachings with Goossens2002’s teachings in the way Petitioner proposes and would have had a reasonable expectation of success. *See supra* § IV.E.3(g). Hence, Petitioner

demonstrates a reasonable likelihood of proving that claim 10 is unpatentable under § 103(a) as obvious over Goossens2002 and Drake.

4. DEPENDENT CLAIMS 2, 6, 9, AND 11–16

Claim 2 depends directly from claim 1, and claims 6 and 9 depend directly from claim 2. Ex. 1001, 18:49–51, 18:60–19:5, 19:17–20.

Claims 11–16 depend directly from claim 10. *Id.* at 20:7–27.

For claims 2, 6, 9, and 11–16, Petitioner provides an analysis supported by Dr. Mowry’s testimony about how the combined disclosures in Goossens2002 and Drake teach the claimed subject matter. *See* Pet. 32–42, 45–48; Ex. 1003 ¶¶ 117–122, 127–136, 146–154.

Patent Owner disputes that the combined disclosures in Goossens2002 and Drake teach the subject matter in claims 2, 6, 9, and 11–16 for the reasons Patent Owner disputes that the combined disclosures teach claim 10’s subject matter. *See* Prelim. Resp. 56.

Based on the current record and for (1) the reasons stated by Petitioner and supported by Dr. Mowry’s testimony and (2) the reasons discussed above for claim 10, Petitioner establishes sufficiently that the combined disclosures in Goossens2002 and Drake teach the subject matter in claims 2, 6, 9, and 11–16. *See* Pet. 32–42, 45–48; Ex. 1003 ¶¶ 117–122, 127–136, 146–154; *supra* § IV.E.3. Hence, Petitioner demonstrates a reasonable likelihood of proving that claims 2, 6, 9, and 11–16 are unpatentable under § 103(a) as obvious over Goossens2002 and Drake.

F. Alleged Obviousness over Goossens2003 and Drake: Claims 1–6 and 9–16

Petitioner contends that claims 1–6 and 9–16 are unpatentable under § 103(a) as obvious over Goossens2003 and Drake. *See* Pet. 9, 48–68;

Prelim. Reply 6–7. As discussed above, Patent Owner statutorily disclaimed claims 1 and 3–5. Ex. 2062, 3; *see* Prelim. Resp. 13 n.1, 41 n.4; *supra* § II.D. Patent Owner disputes that claims 2, 6, and 9–16 are unpatentable under § 103(a) as obvious over Goossens2003 and Drake. *See* Prelim. Resp. 56–63; Prelim. Sur-reply 5–6.

Above, we provided an overview of Drake. *See supra* § IV.E.2. Below, we provide an overview of Goossens2003. Then, we consider the obviousness issues. As explained below, Petitioner establishes sufficiently for purposes of institution that the combined disclosures in Goossens2003 and Drake teach the subject matter in claims 2, 6, and 9–16.

1. OVERVIEW OF GOOSSENS2003 (EXHIBIT 1007)

Goossens2003 is a book chapter titled “Guaranteeing the Quality of Services in Networks on Chip” by Kees Goossens et al. in the book titled “Networks on Chip” edited by Axel Jantsch and Hannu Tenhunen (Kluwer Academic Publishers 2003). Ex. 1007, 61;¹⁸ Ex. 1027 ¶¶ 5–7.

Goossens2003 explains that systems on chip (SoCs) use networks on chip (NoCs) to “solve deep submicron problems” and “divide global problems into local, decoupled problems.” Ex. 1007, 61; *see id.* at 64, 78. An NoC integrates “heterogeneous” intellectual property blocks (IPs) in a “standard fashion” because “the NoC services largely define the platform.” *Id.* at 66. The NoC services “aid in decoupling applications and architectures.” *Id.*; *see id.* at 78.

Goossens2003 describes the Æthereal NoC, consisting of routers and network interfaces (NIs), that provides guaranteed services for “real-time

¹⁸ For Exhibit 1007 (Goossens2003), we follow Petitioner’s practice and cite to the page numbers that appear in the publication.

and critical functions” as well as best-effort services. Ex. 1007, 71–74. “A combination of best-effort and guaranteed services gives the advantages of guaranteed services to only part of the system, but the available resources are used more efficiently.” *Id.* at 71; *see id.* at 79 (“critical parts of the system are predictable, while resources are used more efficiently”). For instance, “a data transport service can be offered both with and without completion bounds, to serve different users, in a single SOC.” *Id.* at 71.

The Æthereal NoC offers “differentiated services” with connections for “communication between one master and one or more slaves, with an associated service level.” Ex. 1007, 71. Connections are created during the “negotiation phase” of a “resource management” process by “stating the requested service level,” i.e., with IP requirements “stated explicitly.” *Id.* at 65, 67, 71. More particularly, the “IPs negotiate with network interfaces to obtain connections with certain properties.” *Id.* at 77.

In the Æthereal NoC, the NOC “either accepts or rejects the request for the connection.” Ex. 1007, 71. Accepting the request for the connection may “lead to resource reservations in the NOC.” *Id.* When no longer needed, “closing a connection frees the resources.” *Id.* (emphasis omitted).

After “a connection has been created, the master initiates transactions by means of requests” that “zero or more slaves execute, perhaps leading to a response.” Ex. 1007, 72 (emphases omitted). Example transactions include “read, write, acknowledged write, test and set, and flush.” *Id.*

The Æthereal NoC uses “three kinds of connections” as follows:

- (1) a simple connection between a master and a single slave where the master “initiates [a] transaction which the slave executes, possibly resulting in a response (e.g. for a read)”;

- (2) a narrowcast connection between a master and one or more slaves where a request from the master is “executed by exactly one slave”; and
- (3) a multicast connection between a master and one or more slaves where a request from the master is “duplicated and each slave receives a copy.”

Ex. 1007, 72 (emphases omitted).

Goossens2003’s Figures 4.4 and 4.5 (reproduced below) depict connections used in the *Æthereal* NoC:

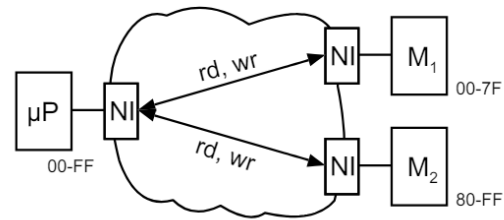
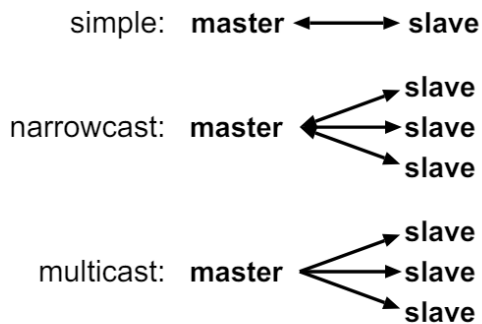


Figure 4.5. A narrowcast connection.

Figure 4.4. Connection types.

Above on the left, Figure 4.4 illustrates (1) a simple connection between a master and a single slave, (2) a narrowcast connection between a master and three slaves, and (3) a multicast connection between a master and three slaves. Ex. 1007, 72. Above on the right, Figure 4.5 illustrates an example narrowcast connection between a master identified as “ μP ” and two slaves identified as “ M_1 ” and “ M_2 ” together with a network interface (NI) associated with each module. *Id.*

Goossens2003 describes various connection properties including the following:

- (1) data integrity such that “data is transported unchanged”;
- (2) transaction ordering for a single transaction on a single connection where requests and responses are ordered

such that (i) “the master sends a request,” (ii) “a slave receives the request and executes it,” (iii) “the slave sends the response,” and (iv) “the master receives the response”;

- (3) transaction completion stipulating that transactions requesting a response “guarantee that the master always receives a response” containing either (i) “a report that the request was not delivered to the slave,” (ii) “the response of the slave, after it successfully executed the request,” (iii) “a notification that the slave successfully executed the request, but the response was dropped,” or (iv) “a report that the slave failed to execute the request”;
- (4) connection flow control guaranteeing that data sent “will fit in the buffers at the receiving end” by preventing buffer overflow at a network interface; and
- (5) bounds on connection throughput, latency, and jitter, e.g., guaranteed bandwidth per fixed time interval.

Ex. 1007, 72–74, 77.

In the *Æthereal* NoC, a connection may have “any combination of these properties (e.g. a throughput guarantee, flow control, but no transaction ordering).” Ex. 1007, 73. Moreover, “the request and response communications can be independently configured (e.g. for flow control, and throughput guarantees), allowing more fine-grained resource management.” *Id.* at 74.

To route both guaranteed-throughput (GT) packets and best-effort (BE) packets, the *Æthereal* NoC uses combined but logically separate GT-BE routers to “share the router resources” and “obtain the advantages of both.” Ex. 1007, 76. The GT router “offers a fixed end-to-end latency for its traffic, which has the highest priority.” *Id.* The BE router uses bandwidth that “not been reserved or is not used by GT traffic.” *Id.*

2. INDEPENDENT CLAIM 10

(a) Preamble 10.pre.1, 10.pre.2, and 10.pre.3

Claim 10's preamble recites as follows:

[m]ethod for exchanging messages in an integrated circuit comprising a plurality of modules, the messages between the modules being exchanged over connections via a network, wherein said connections comprises [sic] a set of communication channels each having a set of connection properties, any communication channel being independently configurable, wherein said connection through the network supports transactions comprising at least one of outgoing messages from the first module to the second module and return messages from the second module to the first module.

Ex. 1001, 19:21–30.

(i) Petitioner's Contentions

Petitioner contends that Goossens2003 alone teaches claim 10's preamble and that the combined disclosures in Goossens2003 and Drake teach claim 10's preamble. *See* Pet. 51–54, 56–58, 65–66. Specifically, Petitioner asserts that Goossens2003 discloses:

- (1) a system on chip (SoC), i.e., an integrated circuit, with intellectual property blocks (IPs), i.e., processing modules, interconnected by a network on chip (NoC);
- (2) the NoC includes routers that transport data;
- (3) the NoC provides connections between the various IPs, including connections between a master (or first module) and one or more slaves (or second modules);
- (4) the connections comprise “request” and “response” channels with “connection properties”;
- (5) “the request and response communications can be independently configured (e.g. for flow control, and throughput guarantees), allowing more fine-grained resource management”; and

- (6) after “a connection has been created, the master initiates transactions by means of requests” that “zero or more slaves execute, perhaps leading to a response.”

Pet. 51–54, 56–58, 65–66 (emphases omitted) (quoting Ex. 1007, 72, 74).

Additionally, Petitioner contends that Drake discloses “connections” between an application in a source station (or first module) and a target station (or second module). Pet. 57. Petitioner contends that each “connection” includes two channels, specifically, a “forward direction” channel for outgoing messages and a “backward direction” channel for return messages. *Id.* at 58. According to Petitioner, the “throughput” and “end-to-end delay” (or latency) for each channel may be adjusted independently. *Id.*

(ii) Patent Owner’s Contentions

As discussed above, Patent Owner contends that claim 10’s preamble limits the claim. Prelim. Resp. 18; *supra* § IV.E.3(a)(ii). Patent Owner disputes that Goossens2003 and Drake teach claim 10’s preamble. Prelim. Resp. 49, 57–59. Specifically, Patent Owner asserts that the references do not disclose or render obvious (1) “said connections comprise[] a set of communication channels” and (2) “any communication channel being independently configurable” according to claim 10’s preamble. *Id.* at 49, 57–59.

Regarding “said connections comprise[] a set of communication channels,” Patent Owner contends that “Drake never describes the forward or backward direction as a ‘channel’ in a data stream (connection).” Prelim. Resp. 49 (citing Ex. 1006, 5:30–34; Ex. 2001 ¶ 133); *see id.* at 59. According to Patent Owner, “Drake’s references to ‘forward direction’ and ‘backward direction’ parameters do not suggest that a data stream

(connection) can be partitioned into a set of channels.” *Id.* (citing Ex. 2001 ¶ 133). Patent Owner also contends that Goossens2003 “never mentions or suggests” that “a connection can comprise a set of channels.” *Id.* at 58.

Regarding “any communication channel being independently configurable,” Patent Owner asserts that Petitioner’s contention that Goossens2003 teaches that aspect of claim 10’s preamble rests on the following “single sentence” in Goossens2003: “[T]he request and response communications can be independently configured (e.g. for flow control, and throughput guarantees), allowing more fine-grained resource management.” Prelim. Resp. 58; *see* Ex. 1007, 74. According to Patent Owner, that sentence concerns “request and response communications” rather than “request and response channels of connections.” Prelim. Resp. 58 (emphasis omitted). Patent Owner asserts that Goossens2003 “never states that a channel within a connection has particular connection properties, let alone that its connection properties are independently configurable.” *Id.* (citing Ex. 1007, 71; Ex. 2001 ¶ 161).

Patent Owner also asserts that Goossens2003 “explains that its differentiated services are achieved via connections (not channels), that connections (not channels) are created with a requested service level, and that different connections (not channels) are created and closed independently.” Prelim. Resp. 58 (citing Ex. 2001 ¶ 161).

(iii) Analysis

Generally, a preamble does not limit a claim. *Allen Eng’g*, 299 F.3d at 1346. We need not decide whether claim 10’s preamble limits the claim because, based on the current record, Petitioner establishes sufficiently that Goossens2003 alone teaches claim 10’s preamble and that the combined

disclosures in Goossens2003 and Drake teach claim 10's preamble. *See* Pet. 51–54, 56–58, 65–66; Ex. 1003 ¶¶ 168–172, 174–181, 202–204.

Based on the current record and for the reasons stated by Petitioner and supported by Dr. Mowry's testimony, Petitioner establishes sufficiently that Goossens2003 teaches the undisputed aspects of claim 10's preamble. *See* Pet. 51–54, 56–58, 65–66; Ex. 1003 ¶¶ 168–172, 174–177, 180–181, 202, 204.

Regarding “said connections comprise[] a set of communication channels,” Goossens2003 discloses connections for “communication between one master and one or more slaves, with an associated service level,” that handle a request from a master and a response from a slave. Ex. 1007, 71–72; *see* Ex. 1003 ¶¶ 70, 178. Goossens2003 also discloses that the request and the response may have separate connection properties, e.g., “flow control” and “throughput guarantees,” corresponding to separate channels for the request and the response. Ex. 1007, 72–74; *see* Ex. 1003 ¶¶ 70, 104, 178. A connection may have “any combination of these properties (e.g. a throughput guarantee, flow control, but no transaction ordering).” Ex. 1007, 73.

As Patent Owner notes, Goossens2003 does not use the word “channel” when discussing connections. *See* Ex. 1007, 72–74; Prelim. Resp. 58. But that does not matter because an obviousness analysis “can take account of the inferences” drawn by an ordinarily skilled artisan who has “common sense, common wisdom, and common knowledge.” *See KSR*, 550 U.S. at 418; *Elektro Ltd. v. ZAP Surgical Sys., Inc.*, 81 F.4th 1368, 1374 (Fed. Cir. 2023). Based on Goossens2003's disclosure that the request and the response may have separate connection properties, an ordinarily skilled

artisan would have understood that a connection comprises a “request” channel and a “response” channel. *See* Ex. 1003 ¶ 178; Ex. 1007, 71–72.

Regarding “any communication channel being independently configurable,” Goossens2003 discloses that “the request and response communications can be independently configured (e.g. for flow control, and throughput guarantees), allowing more fine-grained resource management.” Ex. 1007, 74; *see* Ex. 1003 ¶¶ 70, 104, 178.

Further, for the reasons discussed above for the challenge based on Goossens2002 and Drake, Drake discloses (1) “said connections comprise[] a set of communication channels” and (2) “any communication channel being independently configurable” according to claim 10’s preamble. *See* Ex. 1003 ¶¶ 106–107, 179; Ex. 1006, 2:47–54, 4:26–37, 4:50–55, 5:8–14, 5:25–50, 7:46–8:5, 10:9–11, 10:42–46, 12:35–39; *supra* § IV.E.3(a)(iii).

(b) Limitations 10.a and 10.b

Claim 10 recites “the first module issuing a request for a connection with the second module to a communication manager, wherein the request comprises desired connection properties associated with the sets of communication channels.” Ex. 1001, 19:32–35 (limitation 10.a). Claim 10 also recites “the communication manager forwarding the request to a resource manager.” *Id.* at 19:36–37 (limitation 10.b).

(i) Petitioner’s Contentions

a. Limitation 10.a

Petitioner contends that the combined disclosures in Goossens2003 and Drake teach limitation 10.a. *See* Pet. 32–34, 38, 60, 62–63, 66. Specifically, Petitioner asserts that Drake discloses the claimed

“communication manager” for the reasons discussed above for the challenge based on Goossens2002 and Drake. *Id.* at 32–34, 38, 60, 63.

Petitioner asserts that Goossens2003 discloses that the “IPs negotiate with network interfaces to obtain connections with certain properties.”

Pet. 62 (quoting Ex. 1007, 77). Petitioner asserts that when the “IPs make a request for a connection, the desired communication properties and level of service ‘must be stated explicitly.’” *Id.* at 62–63 (quoting Ex. 1007, 67).

Petitioner also asserts that an ordinarily skilled artisan “would have understood the requests issued by the IPs comprise desired connection properties.” *Id.* at 63 (citing Ex. 1003 ¶ 194).

b. Limitation 10.b

Petitioner contends that the combined disclosures in Goossens2003 and Drake teach limitation 10.b. *See* Pet. 22–24, 57–58, 63, 66.

Specifically, Petitioner asserts that Drake discloses the claimed “resource manager” for the reasons discussed above for the challenge based on Goossens2002 and Drake. *Id.* at 22–24, 63, 66. Petitioner asserts that Drake also discloses “connections with two channels—the ‘forward direction’ channel and the ‘backward direction’ channel—for which ‘throughput’ and ‘end-to-end delay’ (i.e., latency)—can be adjusted independently.” *Id.* at 58 (emphasis omitted).

Additionally, Petitioner contends that Goossens2003 discloses:

- (1) connections that “comprise ‘request’ and ‘response’ channels,”; and
- (2) “these channels have ‘connection properties,’ including flow control and throughput guarantees, that ‘can be independently configured.’”

Pet. 57 (quoting Ex. 1007, 72, 74). According to Petitioner, the '449 patent discloses the “same functionality” when explaining that “the connection properties of the request and response parts of a connection can be configured independently for all of throughput, latency and jitter.” *Id.* at 57–58 (quoting Ex. 1001, 11:20–22).

(ii) Patent Owner’s Contentions

Patent Owner disputes that the combined disclosures in Goossens2003 and Drake teach limitations 10.a and 10.b. *See* Prelim. Resp. 56–57, 59; Prelim. Sur-reply 5–6. As discussed above, Patent Owner contends that claim 10 requires a “communication manager” and a “resource manager” that are “separate and distinct.” Prelim. Resp. 14–15, 46; *see supra* § IV.E.3(b)(ii). Patent Owner contends that Goossens2003 does not disclose the “communication manager” or the “resource manager” required by claim 10. Prelim. Resp. 56–57.

Referencing its arguments for the challenge based on Goossens2002 and Drake, Patent Owner asserts that Petitioner fails to identify “separate and distinct” structures in Drake for the “communication manager” and the “resource manager.” Prelim. Resp. 43–46, 57; Prelim. Sur-reply 5–6.

Further, referencing its arguments for the challenge based on Goossens2002 and Drake, Patent Owner asserts that Drake does not disclose “the request comprises desired connection properties associated with the sets of communication channels” as required by limitation 10.a. Prelim. Resp. 59.

(iii) Analysis

Based on the current record, Petitioner establishes sufficiently that the combined disclosures in Goossens2003 and Drake teach limitations 10.a

and 10.b. *See* Pet. 22–24, 32–34, 38, 57–58, 60, 62–63, 66; Prelim. Reply 6–7; Ex. 1003 ¶¶ 91–93, 118–120, 128–132, 178–179, 193–196, 205–206. Specifically, for the reasons discussed above for the challenge based on Goossens2002 and Drake, Drake discloses the “communication manager” and the “resource manager” required by claim 10. *See supra* § IV.E.3(b)(iii).

Further, regarding limitation 10.a’s requirement that “the request comprises desired connection properties associated with the sets of communication channels,” Goossens2003 discloses that a connection comprises a “request” channel and a “response” channel that have “connection properties.” *See* Ex. 1003 ¶ 178; Ex. 1007, 71–74. According to Goossens2003, connections are created during the “negotiation phase” of a “resource management” process by “stating the requested service level,” i.e., with IP requirements “stated explicitly.” Ex. 1007, 65, 67, 71; *see* Ex. 1003 ¶¶ 70, 158, 194. More particularly, the “IPs negotiate with network interfaces to obtain connections with certain properties.” Ex. 1007, 77; *see* Ex. 1003 ¶¶ 185, 193. As Petitioner asserts, an ordinarily skilled artisan “would have understood the requests issued by the IPs comprise desired connection properties.” Ex. 1003 ¶ 194; *see* Pet. 63.

(d) Limitation 10.c

Claim 10 recites “the resource manager determining whether a target connection with the desired connection properties is available.” Ex. 1001, 19:38–40 (limitation 10.c).

Petitioner contends that the combined disclosures in Goossens2003 and Drake teach limitation 10.c. *See* Pet. 31–32, 59, 66. Specifically, Petitioner asserts that Goossens2003 discloses that “when requests for

connections are issued by IPs, its NOC ‘will honour the request if has sufficient resources available, and will reject it otherwise.’” *Id.* at 59 (quoting Ex. 1007, 67).

Additionally, Petitioner asserts that Drake’s QoS allocator 20 receives a QoS request and then “examines the network resources to ‘determine if the QoS parameters required for the data stream is available,’” such that “the request can be satisfied and the connection established.” Pet. 31, 59 (quoting Ex. 1006, 10:44–45). Petitioner also asserts that QoS allocator 20 “determine[s] if the QoS is available in the components in the multimedia transmission path” using a database containing “information regarding the components of the network and the resources reserved by previously allocated connections.” *Id.* at 32 (alteration by Petitioner) (quoting Ex. 1006, 10:47–49).

At this stage of the proceeding, Patent Owner makes no arguments specific to limitation 10.c. *See, e.g.*, Prelim. Resp. 56–63; Prelim. Sur-reply 5–6.

Based on the current record and for the reasons stated by Petitioner and supported by Dr. Mowry’s testimony, Petitioner establishes sufficiently that the combined disclosures in Goossens2003 and Drake teach limitation 10.c. *See* Pet. 31–32, 59, 66; Ex. 1003 ¶¶ 113–116, 182–183, 207.

(e) Limitation 10.d

Claim 10 recites “the resource manager responding with the availability of the target connection to the communication manager.” Ex. 1001, 20:1–2 (limitation 10.d).

Petitioner contends that the combined disclosures in Goossens2003 and Drake teach limitation 10.d. *See* Pet. 40, 63–64, 67. Specifically,

Petitioner asserts that Drake’s QoS allocator 20 receives a QoS request and then “examines the resources of the network to ‘determine if the QoS parameters required for the data stream is available,’ i.e., whether a connection with the requested connection properties is available to be established.” *Id.* at 40, 63–64 (emphasis omitted) (quoting Ex. 1006, 10:44–45). Petitioner asserts that after QoS allocator 20 has made its determination, it “sends a ‘QoS allocation reply’ to the QoS requestor manager (i.e., communication manager) which indicates, among other things, whether the requested connection and connection properties are available.” *Id.* at 40, 63–64 (emphasis omitted) (citing Ex. 1006, 4:55–57, 8:20–29, 8:50–64, Fig. 5).

At this stage of the proceeding, Patent Owner makes no arguments specific to limitation 10.d. *See, e.g.*, Prelim. Resp. 56–63; Prelim. Sur-reply 5–6.

Based on the current record and for the reasons stated by Petitioner and supported by Dr. Mowry’s testimony, Petitioner establishes sufficiently that the combined disclosures in Goossens2003 and Drake teach limitation 10.d. *See* Pet. 40, 63–64, 67; Ex. 1003 ¶¶ 133, 197, 208.

(f) Limitation 10.e

Claim 10 recites “the target connection between the first and second module being established based on the available properties of said communication channels of said connection.” Ex. 1001, 20:4–6 (limitation 10.e).

Petitioner contends that the combined disclosures in Goossens2003 and Drake teach limitation 10.e. *See* Pet. 41–42, 64, 67. Specifically, Petitioner asserts that Goossens2003 discloses that “a request for a

connection will be granted and the connection established if the NoC ‘has sufficient resources available.’” *Id.* at 64 (quoting Ex. 1007, 67).

Additionally, Petitioner asserts that if Drake’s QoS allocator 20 “determines that the requested QoS properties are available, the requested connection between the source and target stations is established along a designated path through the network and required resources are reserved.” Pet. 41, 64 (citing Ex. 1006, 10:9–11, 11:17–19, 11:26–28, code (57), Fig. 5).

At this stage of the proceeding, Patent Owner makes no arguments specific to limitation 10.e. *See, e.g.*, Prelim. Resp. 56–63; Prelim. Sur-reply 5–6.

Based on the current record and for the reasons stated by Petitioner and supported by Dr. Mowry’s testimony, Petitioner establishes sufficiently that the combined disclosures in Goossens2003 and Drake teach limitation 10.e. *See* Pet. 41–42, 64, 67; Ex. 1003 ¶¶ 134, 198, 209.

(g) Alleged Reason to Combine the Teachings of the References

Petitioner identifies a reason that would have prompted an ordinarily skilled artisan to combine Drake’s teachings with Goossens2003’s teachings in the way Petitioner proposes, i.e., “to create an SoC with improved performance and efficiency.” *See* Pet. 48–51. Further, Petitioner asserts that an ordinarily skilled artisan would have had “a reasonable expectation of success” in combining the teachings of the references. *Id.* at 50. Dr. Mowry’s testimony supports Petitioner’s positions. *See* Ex. 1003 ¶¶ 156–166.

For instance, Dr. Mowry testifies that “Goossens2003 does not include certain details regarding the implementation of its guaranteed

services and connections,” such as “a component or mechanism” for (1) “managing resource usage within the NOC” or (2) “determining the availability of the resources required for a requested connection.” Ex. 1003 ¶ 159. Dr. Mowry also testifies that “Drake provides details regarding the implementation of these features” that an ordinarily skilled artisan would have found “helpful in implementing an SoC like the one described by Goossens2003.” *Id.* ¶ 160 (citing Ex. 1006, code (57)).

Dr. Mowry explains that an ordinarily skilled artisan “would have understood that using Drake’s quality of service management process would improve the efficiency and performance of Goossens2003’s network on chip by ensuring that the network resources required to provide guaranteed services are actually available” and “that the network will be able to fulfill its commitments to the IPs that have been granted such services.” Ex. 1003 ¶ 163. According to Dr. Mowry, an ordinarily skilled artisan “would have been particularly interested in Drake’s disclosure of a ‘QoS requestor manager’ to formulate requests for guaranteed services with particular properties and a ‘QoS allocator’ to determine whether the network resources required for the requested services are available.” *Id.* ¶ 160 (citing Ex. 1006, 2:14–40, 4:17–56).

Additionally, Dr. Mowry testifies that an ordinarily skilled artisan would have recognized that “the advantages and benefits of Drake’s system are applicable to a network on silicon like the one described by Goossens2003” for the reasons explained for the challenge based on Goossens2002 and Drake. *Compare* Ex. 1003 ¶¶ 165–166, *with id.* ¶¶ 81–82; *see id.* ¶ 33; *supra* § IV.E.3(g).

Patent Owner disputes that an ordinarily skilled artisan would have been motivated to combine Drake's teachings with Goossens2003's teachings. *See* Prelim. Resp. 59–63. Specifically, Patent Owner asserts that an ordinarily skilled artisan would not have been motivated to combine Drake's off-chip teachings with Goossens2003's on-chip teachings for essentially the same reasons that a skilled artisan would not have been motivated to combine Drake's off-chip teachings with Goossens2002's on-chip teachings. *Compare id.* at 60–62, *with id.* at 52–54.

Additionally, Patent Owner contends that (1) “Drake's source station 10 corresponds to Goossens2003's IP block or processing module” and (2) “Drake's requestor manager 12 concerns the communication network” and is “disposed within the source station 10.” Prelim. Resp. 62–63. Patent Owner contends that modifying Goossens2003's IP block to include Drake's requestor manager 12 conflicts with Goossens2003's teaching to decouple “computation from communication.” *Id.* at 62–63.

Based on the current record, Petitioner establishes sufficiently that an ordinarily skilled artisan would have been motivated to combine Drake's teachings with Goossens2003's teachings in the way Petitioner proposes, i.e., “to create an SoC with improved performance and efficiency.” *See* Pet. 48–51; Ex. 1003 ¶¶ 33, 156–166, 173. As Dr. Mowry explains, an ordinarily skilled artisan “would have understood that using Drake's quality of service management process” with Goossens2003's NoC would improve the NoC's efficiency and performance. Ex. 1003 ¶ 163; *see id.* ¶ 165.

Based on the current record and for the reasons discussed above for the challenge based Goossens2002 and Drake, we disagree with Patent Owner that an ordinarily skilled artisan would have rejected Drake's

teachings concerning off-chip networks as irrelevant to Goossens2003's on-chip network. *See* Prelim. Resp. 60–62; *supra* § IV.E.3(g).

Moreover, Patent Owner mischaracterizes the proposed modification when contending that modifying Goossens2003's IP block to include Drake's requestor manager 12 conflicts with Goossens2003's teaching to decouple “computation from communication.” *See* Pet. 48–51; Prelim. Resp. 62–63. Goossens2003 describes the *Æthereal* NoC for SoCs that integrates “heterogeneous” intellectual property blocks (IPs). Ex. 1007, 61, 66, 71–74; *see* Ex. 1003 ¶¶ 69–70. Petitioner proposes implementing Drake's QoS management process in the NoC, not modifying an IP block. *See* Pet. 49–50; Ex. 1003 ¶¶ 162–163, 173. Consistent with this, Drake explains that the QoS management of “a local area network is almost entirely concentrated in a single QoS management station on the LAN.” Ex. 1006, 2:66–3:1.

(h) Preliminary Conclusion About Obviousness/Nonobviousness

As discussed above, Petitioner's analysis addresses how the combined disclosures in Goossens2003 and Drake teach claim 10's subject matter. *See supra* §§ IV.F.2(a)–(f). Additionally, Petitioner provides a reason with rational underpinning as to why an ordinarily skilled artisan would have been motivated to combine Drake's teachings with Goossens2003's teachings in the way Petitioner proposes and would have had a reasonable expectation of success. *See supra* § IV.F.2(g). Hence, Petitioner demonstrates a reasonable likelihood of proving that claim 10 is unpatentable under § 103(a) as obvious over Goossens2003 and Drake.

3. DEPENDENT CLAIMS 2, 6, 9, AND 11–16

Claim 2 depends directly from claim 1, and claims 6 and 9 depend directly from claim 2. Ex. 1001, 18:49–51, 18:60–19:5, 19:17–20.

Claims 11–16 depend directly from claim 10. *Id.* at 20:7–27.

For claims 2, 6, 9, and 11–16, Petitioner provides an analysis supported by Dr. Mowry’s testimony about how the combined disclosures in Goossens2003 and Drake teach the claimed subject matter. *See* Pet. 59–60, 62–65, 67–68; Ex. 1003 ¶¶ 184–187, 192–200, 210–216.

Patent Owner disputes that the combined disclosures in Goossens2003 and Drake teach the subject matter in claims 2, 6, 9, and 11–16 for the reasons Patent Owner disputes that the combined disclosures teach claim 10’s subject matter. *See* Prelim. Resp. 63.

Based on the current record and for (1) the reasons stated by Petitioner and supported by Dr. Mowry’s testimony and (2) the reasons discussed above for claim 10, Petitioner establishes sufficiently that the combined disclosures in Goossens2003 and Drake teach the subject matter in claims 2, 6, 9, and 11–16. *See* Pet. 59–60, 62–65, 67–68; Ex. 1003 ¶¶ 184–187, 192–200, 210–216; *supra* § IV.F.2. Hence, Petitioner demonstrates a reasonable likelihood of proving that claims 2, 6, 9, and 11–16 are unpatentable under § 103(a) as obvious over Goossens2003 and Drake.

V. CONCLUSION

Based on the arguments and evidence presented by the parties, we determine that there is a reasonable likelihood Petitioner would prevail with respect to at least one claim challenged in the Petition. Hence, we institute an *inter partes* review of all challenged claims on all challenges included in the Petition. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1355 (2018)

(noting that the language of 35 U.S.C. § 314(b) “indicates a binary choice—either institute review or don’t”); *PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1360 (Fed. Cir. 2018) (interpreting the statute as requiring “a simple yes-or-no institution choice respecting a petition, embracing all challenges included in the petition”); 37 C.F.R. § 42.108(a).

At this preliminary stage, we have not made a final determination about the patentability of any challenged claim, the construction of any claim term, phrase, or limitation, or any other legal or factual issue.

VI. ORDER

Accordingly, it is

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–6 and 9–16 in the ’449 patent is instituted on all challenges included in the Petition; and

FURTHER ORDERED that, according to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial that commences on the entry date of this decision.

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Patent 7,373,449 B2

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