

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

QUALCOMM INCORPORATED,
Petitioner,¹

v.

NETWORK SYSTEM TECHNOLOGIES, LLC,
Patent Owner.

IPR2024-00338
Patent 7,373,449 B2

Before CHARLES J. BOUDREAU, STEVEN M. AMUNDSON, and
IFTIKHAR AHMED, *Administrative Patent Judges*.

AMUNDSON, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
Dismissing Petitioner's Motion to Exclude Evidence
35 U.S.C. § 318(a)

¹ Qualcomm Incorporated filed a petition and a motion for joinder in IPR2024-01081 and has been joined as a petitioner in this proceeding. *See* Paper 16. After Qualcomm Incorporated was joined as a petitioner, original Petitioner Samsung Electronics Co., Ltd. was terminated from the proceeding. *See* Paper 17.

I. INTRODUCTION

We have jurisdiction under 35 U.S.C. § 6. We issue this Final Written Decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons explained below, a preponderance of the evidence shows that all challenged claims are unpatentable. *See* 35 U.S.C. § 316(e) (2018).

II. BACKGROUND

A. Procedural History

In December 2023, Samsung Electronics Co., Ltd. (“Samsung”) initiated this proceeding by filing a Petition requesting an *inter partes* review of claims 1–6 and 9–16 in U.S. Patent No. 7,373,449 B2 (“the ’449 patent”) (Exhibit 1001) under 35 U.S.C. §§ 311–319. *See* Paper 2 (“Samsung Pet.”).

In March 2024, Network System Technologies, LLC (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”). Three days before filing the Preliminary Response, however, Patent Owner statutorily disclaimed claims 1 and 3–5. Ex. 2062, 3; *see* Prelim. Resp. 13 n.1, 41 n.4.

In April 2024, after receiving Board authorization, Samsung filed a Preliminary Reply. Paper 8 (“Prelim. Reply”); *see* Ex. 3001.

In May 2024, Patent Owner filed a Preliminary Sur-reply. Paper 9 (“Prelim. Sur-reply”).

In June 2024, after analyzing the arguments and evidence presented by the parties, the Board instituted an *inter partes* review of all challenged claims based on all challenges included in Samsung’s Petition. Paper 10 (“Inst. Dec.”), 87.

In June 2024, on the same day that the Board instituted an *inter partes* review in this proceeding, Qualcomm Incorporated (“Petitioner” or

“Qualcomm”) filed a petition in IPR2024-01081 challenging claims 2, 6, and 9–16 in the ’449 patent on substantively identical grounds to those asserted in Samsung’s Petition. *Qualcomm Incorporated v. Network System Technologies, LLC*, IPR2024-01081, Paper 1 (“Pet.”).² Concurrently with filing the petition in IPR2024-01081, Petitioner filed a motion for joinder, seeking joinder as a party in this proceeding under 35 U.S.C. § 315(c). IPR2024-01081, Paper 3.

In July 2024, Patent Owner filed a response to Petitioner’s motion for joinder in IPR2024-01081 and urged the Board to deny the motion for various reasons. *See* IPR2024-01081, Paper 7. In July 2024, Patent Owner also filed a preliminary response in IPR2024-01081 and urged the Board to deny institution for various reasons. *See* IPR2024-01081, Paper 9.

In October 2024, the Board (1) instituted an *inter partes* review in IPR2024-01081, (2) granted Petitioner’s motion for joinder in IPR2024-01081, and (3) joined Petitioner as a party in this proceeding. Paper 16 (“Qualcomm Inst. Dec.”), 50–51; IPR2024-01081, Paper 14 at 50–51. The next day, based on a settlement between Samsung and Patent Owner, the Board granted in part a joint motion to terminate filed by Samsung and Patent Owner and terminated Samsung as a petitioner in this proceeding. *See* Paper 14 (Joint Motion); Paper 17 (Order).

² In the Response, the Reply, and the Sur-reply, the parties cite to the petition in IPR2024-01081 unless otherwise indicated. *See, e.g.*, Resp. 1 n.1, Reply 3 n.3; Sur-reply 1 & n.1. For consistency with the parties, clarity of the record, and ease of reference, this decision also cites to the petition in IPR2024-01081 unless otherwise indicated. Nonetheless, as noted above, the petition in IPR2024-01081 is substantively identical to the Petition in this proceeding.

In November 2024, Patent Owner filed a Response to the Petition. Paper 35 (“Resp.”). In January 2025, Petitioner filed a Reply to Patent Owner’s Response. Paper 43 (“Reply”). In March 2025, Patent Owner filed a Sur-reply to Petitioner’s Reply. Paper 55 (“Sur-reply”).

Further, after receiving Board authorization, Patent Owner filed a motion to strike certain allegedly new unpatentability theories in Petitioner’s Reply and an accompanying declaration. Paper 53; *see* Ex. 3007. Petitioner filed an opposition to Patent Owner’s motion to strike. Paper 54.

Also, Petitioner filed a motion to exclude certain evidence submitted with Patent Owner’s Response and certain evidence submitted with Patent Owner’s Sur-reply. Paper 57. Patent Owner filed an opposition to Petitioner’s motion to exclude. Paper 59. And Petitioner filed a reply to Patent Owner’s opposition. Paper 61.

In March 2025, we issued an Order denying Patent Owner’s motion to strike. Paper 64.

Later in March 2025, we held a previously scheduled oral hearing. The record includes the hearing transcript. Paper 67 (“Tr.”).

In April 2025, Patent Owner filed a request for rehearing of the Order denying Patent Owner’s motion to strike. Paper 65.

In May 2025, we issued a Decision denying Patent Owner’s request for rehearing. Paper 68.

B. Real Parties in Interest

Petitioner identifies the following real parties in interest: Qualcomm Incorporated and Qualcomm Technologies, Inc. Pet. 74. 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.

C. 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. 74; 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.

D. 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:

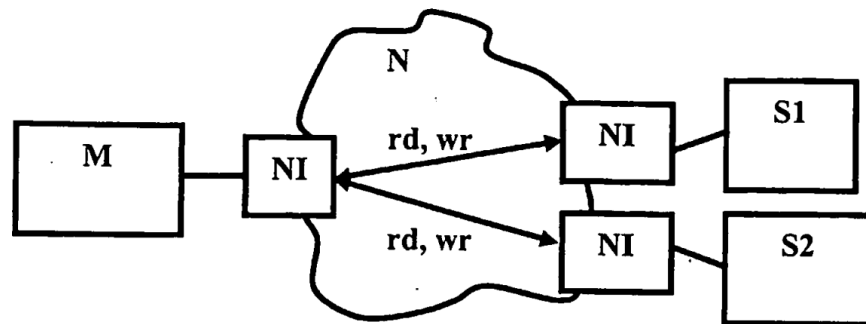


FIG.1

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:

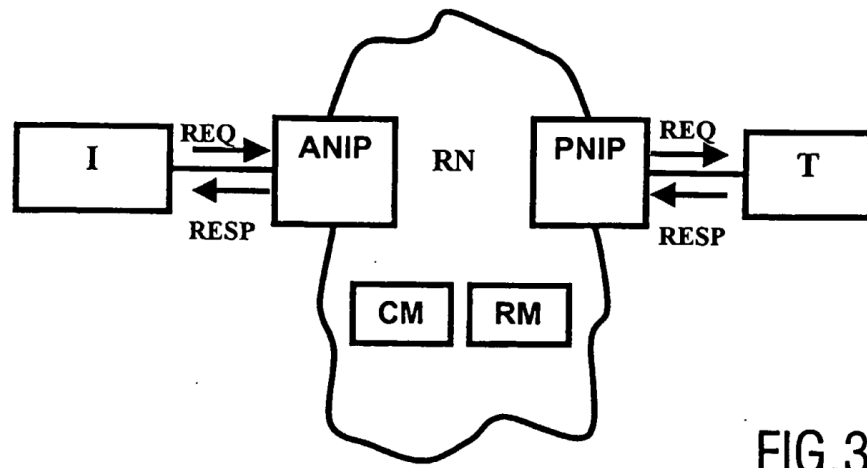


FIG.3

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.

E. The Challenged Claims

The ’449 patent originally included eighteen claims as follows:

- independent claim 1 for an “[i]ntegrated circuit”;
- claims 2–9 that depend directly or indirectly from claim 1;
- independent claim 10 for a “[m]ethod for exchanging messages in an integrated circuit”; and
- claims 11–18 that depend directly or indirectly from claim 10.

Ex. 1001, 18:32–20:38.

As discussed above, Samsung challenged claims 1–6 and 9–16. Samsung Pet. 9, 15–68; *supra* § I. As also discussed above, Patent Owner statutorily disclaimed claims 1 and 3–5. Ex. 2062, 3; *see* Prelim. Resp. 13 n.1, 41 n.4; *supra* § I. Petitioner challenges claims 2, 6, and 9–16. Pet. 10, 16–71.

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):³

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

³ We use the same reference numbers and letters that Petitioner uses to identify the claim language. *See* Pet. 45–47.

properties, any communication channel being independently configurable,

[10.pre.3] 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

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.

F. 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> , in Proceedings of the 2002 Design, Automation and Test in Europe Conference and Exhibition (DATE'02), 1–3 (March 2002)	1005
Drake	US 5,461,611, issued October 24, 1995 (based on an application filed June 7, 1994)	1006

Name	Reference	Exhibit
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. 8–14, 16–71.

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. 8–9; *see* 35 U.S.C. § 102(a), (b), (e) (2006).⁴

As explained below, Patent Owner disputes that Goossens2002 and Goossens2003 qualify as prior art. *See infra* § III.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* Resp. 64–68; Sur-reply 26–29.

G. The Asserted Challenges to Patentability

Samsung asserted 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

⁴ 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.

Samsung Pet. 9, 15–68.

Petitioner asserts the following challenges to patentability:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
2, 6, 9–16	103(a)	Goossens2002, Drake
2, 6, 9–16	103(a)	Goossens2003, Drake

Pet. 10, 16–71.

H. Testimonial Evidence

To support its challenges, Petitioner relies on (1) the Declaration of Todd Mowry, Ph.D. (Exhibit 1003) and (2) the Declaration of Dr. Todd Mowry in Support of Petitioner’s Reply (Exhibit 1043). Dr. Mowry states, “I have been retained as an expert witness.” 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 following declarations to establish the public accessibility of Goossens2002 and Goossens2003 before the ’449 patent’s filing date:

- Declaration of Gordon MacPherson (Exhibit 1025) regarding Goossens2002;
- Declaration of Sean O’Bryan (Exhibit 1027) regarding Goossens2003;
- Declaration of Sylvia Hall-Ellis, Ph.D. (Exhibit 1035) regarding Goossens2003;
- Declaration of Nikil Dutt, Ph.D. (Exhibit 1044) regarding Goossens2002; and
- Declaration of Sylvia Hall-Ellis, Ph.D. (Exhibit 1046) regarding Goossens2002.

To support its positions, Patent Owner relies on the Declaration of Dr. Nader Bagherzadeh (Exhibit 2070). Dr. Bagherzadeh states, “I have been retained on behalf of Patent Owner” as “an expert consultant.” Ex. 2070 ¶ 1. Dr. Bagherzadeh also states, “I earned a Bachelor of Science degree, with honors, in Electrical Engineering from the University of Texas at Austin in 1977,” “a Master of Science degree in Electrical Engineering from the University of Texas at Austin in 1979, with a focus on communications theory and signal detection algorithms,” and “a Ph.D. in Computer Engineering from the University of Texas at Austin in 1987 with a focus on parallel processing and computer architecture.” *Id.* ¶ 7.

Additionally, Petitioner submits deposition testimony from Dr. Bagherzadeh, i.e., Exhibit 1037 (Jan. 16, 2025, Bagherzadeh Dep. Tr.). Patent Owner submits deposition testimony from the following:

- Dr. Dutt, i.e., Exhibit 2067 (Aug. 27, 2024, Dutt Dep. Tr. in IPR2024-00343) and Exhibit 2087 (Feb. 25, 2025, Dutt Dep. Tr.);
- Dr. Mowry, i.e., Exhibit 2078 (Nov. 4, 2024, Mowry Dep. Tr.) and Exhibit 2088 (Feb. 11, 2025, Mowry Dep. Tr.);
- Mr. O’Bryan, i.e., Exhibit 2079 (Nov. 15, 2024, O’Bryan Dep. Tr. in IPR2024-00343); and
- Mr. MacPherson, i.e., Exhibit 2080 (Sept. 20, 2024, MacPherson Dep. Tr. in IPR2024-00343).

I. Burden

In an *inter partes* review, a petitioner bears the burden of persuasion to prove “unpatentability by a preponderance of the evidence.” *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (quoting 35 U.S.C. § 316(e)); *see* 37 C.F.R. § 42.1(d) (2024).

III. 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 The parties do not provide evidence or argument regarding objective indicia of nonobviousness. *See, e.g.*, Pet. 16–71; Resp. 17–64. Dr. Mowry states, “I am unaware of any secondary considerations of non-obviousness that provide evidence that” the challenged claims of the ’449 patent are “not obvious.” Ex. 1003 ¶ 217.

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. 15. 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.

For “purposes of this proceeding only, Patent Owner applies Petitioner’s proposed level of skill.” Resp. 12.

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. 1001, 8:40–20:38; Ex. 1003 ¶¶ 60–61; *infra* §§ III.E.1–III.E.2.

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 for patent infringement. *See* 37 C.F.R. § 42.200(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).

The “person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification.” *Phillips*, 415 F.3d at 1313. “Properly viewed, the ‘ordinary meaning’ of a claim term is its meaning to the ordinary artisan after reading the entire patent.” *Id.* at 1321.

“Where a claim lists elements separately, ‘the clear implication of the claim language’ is that those elements are ‘distinct component[s]’ of the patented invention.” *Becton, Dickinson & Co. v. Tyco Healthcare Grp., LP*, 616 F.3d 1249, 1254 (Fed. Cir. 2010) (alteration by the court) (quoting *Gaus v. Conair Corp.*, 363 F.3d 1284, 1288 (Fed. Cir. 2004)).

2. MEANS-PLUS-FUNCTION CLAIMING

The patent statute provides that “[a]n element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.”

35 U.S.C. § 112 ¶ 6 (2006). The absence of the word “means” in a claim limitation creates a rebuttable presumption that § 112’s means-plus-function provision does not apply. *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1348 (Fed. Cir. 2015) (en banc in relevant part).

When a claim limitation lacks the word “means,” a party may rebut the presumption that § 112’s means-plus-function provision does not apply by demonstrating that “the claim term fails to ‘recite[] sufficiently definite structure’ or else recites ‘function without reciting sufficient structure for performing that function.’” *Williamson*, 792 F.3d at 1348 (alteration by the court) (quoting *Watts v. XL Sys., Inc.*, 232 F.3d 877, 880 (Fed. Cir. 2000)). But § 112’s means-plus-function provision does not apply if a claim limitation contains a term or phrase “used in common parlance or by persons of skill in the pertinent art to designate structure.” *Lighting World, Inc. v. Birchwood Lighting, Inc.*, 382 F.3d 1354, 1359 (Fed. Cir. 2004). For instance, “many devices take their names from the functions they perform,” such as “‘filter,’ ‘brake,’ ‘clamp,’ ‘screwdriver,’ or ‘lock.’” *Greenberg v. Ethicon Endo-Surgery, Inc.*, 91 F.3d 1580, 1583 (Fed. Cir. 1996).

Construing a means-plus-function limitation involves two steps: first, identify the claimed function or functions; and second, determine what structure, if any, disclosed in the patent’s specification corresponds to the

claimed function or functions. *Williamson*, 792 F.3d at 1351; *see Medtronic, Inc. v. Advanced Cardiovascular Sys., Inc.*, 248 F.3d 1303, 1311 (Fed. Cir. 2001). For the second step, a person of ordinary skill in the art must “recognize the structure in the specification and associate it with the corresponding function in the claim.” *All-Voice Computing PLC v. Nuance Commc’ns, Inc.*, 504 F.3d 1236, 1241 (Fed. Cir. 2007). The “duty to link or associate structure to function is the *quid pro quo* for the convenience” of using means-plus-function claiming. *B. Braun Med., Inc. v. Abbott Lab’ys*, 124 F.3d 1419, 1424 (Fed. Cir. 1997).

When a limitation recites two or more functions, the specification “must disclose adequate corresponding structure to perform *all* of the claimed functions.” *Media Rights Techs., Inc. v. Capital One Fin. Corp.*, 800 F.3d 1366, 1374 (Fed. Cir. 2015) (emphasis by the court); *see Noah Sys., Inc. v. Intuit Inc.*, 675 F.3d 1302, 1318–19 (Fed. Cir. 2012) (considering means-plus-function limitation specifying two functions).

3. PETITIONER’S POSITION

(a) Petitioner’s General Position

In the petition in IPR2024-01081, Petitioner agreed to “apply the claim terms as applied in” this proceeding. Pet. 16 & n.3; *see id.* at 35 n.6.

In its Petition, Samsung contended that “the Board does not need to construe any claim term for purposes of evaluating the prior art.” Samsung Pet. 15.

In the Reply, Petitioner contends that the Board does not need to construe any claim term. Reply 2.

(b) Means-Plus-Function Claiming

In its Petition, Samsung noted that “parties in parallel proceedings have argued” that § 112’s means-plus-function provision applies to the term “communication manager.” Samsung Pet. 33 n.3 (citing Ex. 1019,⁶ 12–13). Samsung also noted that Patent Owner disagrees that § 112’s means-plus-function provision applies to the term “communication manager.” *Id.*

In its Petition, Samsung asserted 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.’” Samsung Pet. 33 n.3 (citation omitted) (quoting Ex. 2022,⁷ 60). Samsung also asserted that “these structures are disclosed and/or rendered obvious” by the asserted references. *Id.*; *see id.* at 32–34, 38, 44, 60, 63, 66.

4. PATENT OWNER’S POSITION

In the Response, Patent Owner discusses claim-construction issues concerning the following terms:

- “first module” in claims 1, 6, and 10;
- “communication manager” in claims 2, 6–8, and 10;
- “adjustable independently” in claim 1; and
- “independently configurable” in claim 10.

See Resp. 12–17.

⁶ For Exhibit 1019 (Local Patent Rule 4-3 Joint Claim Construction and Prehearing Statement), we cite to the page numbers applied to the exhibit, which are the same as the header page numbers.

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

Specifically, Patent Owner asserts that the claimed “first module” and the claimed “communication manager” should be construed as “separate and distinct claim elements.” Resp. 13; *see* Sur-reply 20; Tr. 31:1–13, 61:22–62:4. According to Patent Owner, the “plain claim language” lists the elements separately and “gives rise to a presumption” that they are “distinct elements of the invention.” Resp. 13 (citing *Becton, Dickinson*, 616 F.3d at 1254).

Additionally, Patent Owner notes that the district court in the TI litigation decided that § 112’s means-plus-function provision applies to the claimed “communication manager.” Resp. 16. According to Patent Owner, the district court “identified (1) the function as ‘forwarding a request to a resource manager’ and (2) the structure as ‘portion of the circuit configured to implement the scheme disclosed in the ’449 Patent at 10:19–24, 10:41–54.’” *Id.* (quoting Ex. 2022, 60). Patent Owner notes that the district court in the Samsung litigation “indicated that the Court would adopt the same construction” as the district court in the TI litigation. *Id.* (citing Ex. 2084 (Apr. 9, 2024, Markman Hr’g Tr.), 3:19–4:11). Patent Owner also notes that Petitioner argued in the Qualcomm litigation that § 112’s means-plus-function provision applies to the claimed “communication manager.” *Id.*

Further, Patent Owner asserts that “adjustable independently” in claim 1 and “independently configurable” in claim 10 are “synonymous, except for the fact that ‘adjustable independently’ refers to the connection properties of the communication channels, while ‘independently configurable’ refers to the communication channels having connection properties.” Resp. 17 (citing Ex. 2078, 117:3–10). Patent Owner also

asserts that the parties agreed in the Qualcomm litigation that “independently configurable” means “[a]ble to be configured with connection properties that do not depend on those of another configuration.” *Id.* at 16–17 (alteration by Patent Owner).

5. 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. 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). We determine that no claim term requires an explicit construction to decide whether Petitioner has shown by a preponderance of the evidence that claims 2, 6, and 9–16 are unpatentable under § 103(a).

Regarding Patent Owner’s assertion that the claimed “first module” and the claimed “communication manager” should be construed as “separate and distinct claim elements,” Petitioner identifies separate and distinct elements in the references that correspond to these claim elements. *See, e.g.*, Pet. 41, 55, 59, 65; Resp. 13; Reply 3–4, 16–17, 21; Ex. 1003 ¶¶ 130, 170, 176, 193–194; Ex. 1043 ¶¶ 13, 74; *infra* §§ III.E.4(a)(i), III.E.4(a)(iii), III.E.4(b)(i), III.E.4(b)(iii), III.E.4(g)(ii)–(iii).

Regarding the claimed “communication manager,” the claims lack the word “means.” Ex. 1001, 18:49–51, 18:60–19:16, 19:21–20:6. Thus, as Patent Owner recognizes, there is a rebuttable presumption that § 112’s means-plus-function provision does not apply. *See* Ex. 2041,⁸ 18;

⁸ For Exhibit 2041 (Response Claim Construction Brief), we cite to the page numbers of the brief rather than the header page numbers.

Ex. 2045,⁹ 6; *Williamson*, 792 F.3d at 1348. Neither party provides a reason to overcome that rebuttable presumption. *See* Pet. 15–16, 16 n.3, 35 n.6; Resp. 16; Reply 2; Sur-reply 2; Tr. 54:12–55:13, 61:22–62:4. Hence, the claimed “communication manager” should have its ordinary meaning as understood by “the ordinary artisan after reading the entire patent.” *See Phillips*, 415 F.3d at 1312–13, 1321.

Although the district courts in the TI litigation, the Samsung litigation, and the Qualcomm litigation decided that § 112’s means-plus-function provision applies to the claimed “communication manager,” they did so based on different records and different arguments. *See, e.g.*, Ex. 1020,¹⁰ 18–21; Ex. 1052,¹¹ 23–27; Ex. 2022, 38–42, 60; Ex. 2034,¹² 14–16; Ex. 2035,¹³ 11–13; Ex. 2036,¹⁴ 1–2; Ex. 2040,¹⁵ 18–21; Ex. 2041, 18–19;

⁹ For Exhibit 2045 (Supplemental Claim Construction Brief), we cite to the page numbers of the brief rather than the header page numbers.

¹⁰ For Exhibit 1020 (Opening Claim Construction Brief), we cite to the page numbers of the brief rather than the header page numbers.

¹¹ For Exhibit 1052 (Claim Construction Order), we cite to the page numbers applied to the exhibit, which are the same as the header page numbers.

¹² For Exhibit 2034 (Opening Claim Construction Brief), we cite to the page numbers of the brief rather than the header page numbers.

¹³ For Exhibit 2035 (Responsive Claim Construction Brief), we cite to the page numbers of the brief rather than the header page numbers.

¹⁴ For Exhibit 2036 (Reply Claim Construction Brief), we cite to the page numbers of the brief rather than the header page numbers.

¹⁵ For Exhibit 2040 (Opening Claim Construction Brief), we cite to the page numbers of the brief rather than the header page numbers.

Ex. 2042,¹⁶ 9–10; Ex. 2043,¹⁷ 8–10; Ex. 2044,¹⁸ 2–6; Ex. 2045, 5–7;
Ex. 2084, 4:8–11.

We note that the district court in the Qualcomm litigation disagreed with the district courts in the TI litigation and the Samsung litigation regarding the corresponding structure disclosed in the '449 patent for the claimed “communication manager.” *See* Ex. 1052, 23; Ex. 2022, 41–42, 60; Ex. 2084, 4:8–11. Unlike the district courts in the TI litigation and the Samsung litigation, the district court in the Qualcomm litigation determined that the '449 patent fails to disclose adequate corresponding structure for the claimed “communication manager.”¹⁹ Ex. 1052, 25–26.

Regarding “independently configurable” in claim 10, Petitioner explains how the references satisfy that requirement under the agreed-upon construction in the Qualcomm litigation. *See, e.g.*, Pet. 29–31, 46, 60, 69; Resp. 16–17; Reply 21–23; Ex. 1003 ¶¶ 106–110, 139, 176–179, 203; Ex. 1043 ¶¶ 96–108; Ex. 2040, 6; *infra* §§ III.E.4(a)(i), III.E.4(a)(iii).

¹⁶ For Exhibit 2042 (Reply Claim Construction Brief), we cite to the page numbers of the brief rather than the header page numbers.

¹⁷ For Exhibit 2043 (Sur-reply Claim Construction Brief), we cite to the page numbers of the brief rather than the header page numbers.

¹⁸ For Exhibit 2044 (Supplemental Claim Construction Brief), we cite to the page numbers of the brief rather than the header page numbers.

¹⁹ When a patent lacks an adequate disclosure of structure corresponding to the function or functions recited in a means-plus-function limitation, there is a failure “to particularly point out and distinctly claim the invention” as required by the patent statute. *In re Donaldson Co.*, 16 F.3d 1189, 1195 (Fed. Cir. 1994) (en banc).

*D. Whether Goossens2002 and Goossens2003
Are Prior-Art 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, “the petitioner bears the burden of establishing by a preponderance of the evidence that a particular document is a printed publication.” *Nobel Biocare Servs. AG v. Intradent USA, Inc.*, 903 F.3d 1365, 1375 (Fed. Cir. 2018).

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). A petitioner 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 Pharms., Inc. v. Amneal Pharms., LLC*, 895 F.3d 1347, 1355–56 (Fed. Cir. 2018).

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). For instance, the Federal Circuit has held that a doctoral thesis indexed and shelved in one university library

was sufficiently accessible to the public to constitute a printed publication. *In re Hall*, 781 F.2d 897, 899 (Fed. Cir. 1986). In doing so, the Federal Circuit rejected the argument that “a single cataloged thesis in one university library does not constitute sufficient accessibility to those interested in the art exercising reasonable diligence.” *Id.* at 899–900.

Although indexing “is a relevant factor in determining accessibility of potential prior art, particularly library-based references,” indexing “is not ‘a necessary condition for a reference to be publicly accessible.’” *Voter Verified, Inc. v. Premier Election Sols., Inc.*, 698 F.3d 1374, 1380 (Fed. Cir. 2012) (quoting *In re Lister*, 583 F.3d 1307, 1312 (Fed. Cir. 2009)). “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).

Uploading a document to a website may make the document “technically accessible” since “someone could theoretically find it on the Internet,” but uploading a document to a website does not necessarily make the document “publicly accessible.” *Samsung Elecs. Co. v. Infobridge Pte. Ltd.*, 929 F.3d 1363, 1369 (Fed. Cir. 2019); *see Acceleration Bay*, 908 F.3d at 772–74. For a document uploaded to a website, a petitioner must present “some evidence that a person of ordinary skill could have reasonably found the website” and then found the document “on that website.” *See Samsung*, 929 F.3d at 1369.

2. PETITIONER’S CONTENTIONS

(a) Goossens2002

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; Reply 26–28.

As support, Petitioner submitted the following evidence with the Petition: (1) Declaration of Gordon MacPherson (Exhibit 1025); and (2) IEEE Xplore bibliographic data for Goossens2002 (Exhibit 1026).²⁰ Pet. xi (List of Exhibits). As further support, Petitioner submitted the following evidence with the Reply: (1) Declaration of Nikil Dutt, Ph.D. (Exhibit 1044); (2) Declaration of Sylvia Hall-Ellis, Ph.D. (Exhibit 1046); and (3) documentary evidence cited in the Dutt and Hall-Ellis declarations. Reply vi (Exhibit List).

For example, the IEEE Xplore bibliographic data for Goossens2002 includes the following information: “Date of Conference: 04-08 March 2002” and “Date Added to IEEE Xplore: 07 August 2002.” Ex. 1026, 1.

Additionally, Petitioner asserts that (1) the “IEEE is an established publisher” and (2) “there is a presumption of public accessibility as of the publication date” that Patent Owner has not rebutted. Reply 27 (quoting *VidStream*, 981 F.3d at 1065).

(b) Goossens2003

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. 9; Reply 24–25. As support, Petitioner submitted the following evidence with the Petition: (1) Declaration of Sean O'Bryan (Exhibit 1027); and (2) publisher bibliographic data for Goossens2003 (Exhibit 1028). Pet. xi (List of Exhibits). As further support, Petitioner submitted the following as

²⁰ The acronym “IEEE” stands for “Institute of Electrical and Electronics Engineers.”

supplemental information under 37 C.F.R. § 42.123(b): Declaration of Sylvia Hall-Ellis, Ph.D. (Exhibit 1035). *See* Paper 37 (Order), 19.

For example, the publisher bibliographic data for Goossens2003 includes the following information: “Publisher: Springer New York, NY” and “Published: 31 January 2003.”²¹ Ex. 1028, 4.

(c) The Petition’s Summary of the Evidence Submitted with the Petition

After contending that Goossens2002 and Goossens2003 were “published and publicly available” before the ’449 patent’s October 7, 2003, filing date, the Petition 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 [MacPherson declaration]; Ex-1027 [O’Bryan declaration]; Ex-1028 [publisher bibliographic data for Goossens2003]; *Hulu[, LLC v. Sound View Innovations, LLC*, IPR2018-01039], Paper 29 at 12–14, 17–21.

Pet. 10; *see id.* at 8–10.

3. PATENT OWNER’S CONTENTIONS

(a) The Petition’s Summary of the Evidence Submitted with the Petition

Patent Owner contends that the Petition’s “blanket citations” to “three exhibits ‘to support conclusory statements for which the Petition does not otherwise provide an argument or explanation’ is improper.” Resp. 64 (quoting *Cisco Sys., Inc. v. C-Cation Techs., LLC*, IPR2014-00454, Paper 12 at 9 (PTAB Aug. 29, 2014) (informative)); *see* Sur-reply 26–27. According

²¹ In 2004, the original publisher of the book titled “Networks on Chip,” i.e., Kluwer Academic Publishers, merged with Springer. Prelim. Reply 3 n.2.

to Patent Owner, the Petition improperly incorporates by reference three exhibits “via blanket citations.” Sur-reply 26; *see* Resp. 64–65.

(b) Goossens2002

Patent Owner disputes that the evidence establishes that Goossens2002 is a printed publication under § 102. *See* Resp. 65–67; Sur-reply 27–28. In particular, Patent Owner contends that Mr. MacPherson (1) did not work at the IEEE until 2007, (2) lacks personal knowledge of the IEEE’s business practices before 2007, (3) lacks personal knowledge about the conference proceedings titled “Proceedings 2002 Design, Automation and Test in Europe Conference and Exhibition,” (4) “was unfamiliar with certain IEEE practices, including whether IEEE performed spot checks to verify information,” and (5) “cannot attest to whether” the IEEE Xplore bibliographic data is “accurate.” Resp. 65–66 (citing Ex. 2080, 9:5–11, 14:2–16:20, 20:25–22:19, 25:15–26:10);²² Sur-reply 28. Patent Owner contends that “[i]nformation in IEEE Xplore can be miscatalogued and inaccurate.” Resp. 66. Further, Patent Owner asserts that the IEEE’s “terms of service state that users should not rely on such information being appropriately catalogued for purposes of ‘invalidity of . . . any patent.’” *Id.* (alteration by Patent Owner) (quoting Ex. 2081, 3).

Patent Owner contends that “Dr. Dutt’s testimony about availability of Goossens2002 via IEEE Xplore is based on” Mr. MacPherson’s declaration (Exhibit 1025) and the IEEE Xplore bibliographic data for Goossens2002

²² The Response references “EX2079” (Mr. O’Bryan’s deposition transcript) rather than “EX2080” (Mr. MacPherson’s deposition transcript). *See* Resp. 65–66.

(Exhibit 1026) “provided to him by counsel, not his personal knowledge.”
Sur-reply 28.

Additionally, Patent Owner contends that Petitioner provides “no evidence” that Goossens2002 “was sufficiently indexed, catalogued, and shelved” in IEEE Xplore “during the relevant timeframe.” Resp. 66 (quoting *Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29 at 9 (PTAB Dec. 20, 2019) (precedential)).

(c) Goossens2003

Patent Owner disputes that the evidence establishes that Goossens2003 is a printed publication under § 102. *See* Resp. 67–68; Sur-reply 28–29. In particular, Patent Owner contends that Mr. O’Bryan (1) did not work at the University of Texas “during the relevant timeframe” and (2) did not know the meaning of some three-digit field codes used in the MACHine-Readable Cataloging (MARC) record for Goossens2003, e.g., field code 005. Resp. 67 (citing Ex. 2079, 8:22–9:12, 18:24–21:2);²³ *see* Ex. 2079, 18:24–19:6.

Patent Owner contends that the declarations from Mr. O’Bryan and Dr. Hall-Ellis “show mere ‘technical accessibility’ at a library, which is insufficient.” Sur-reply 28 (citing *Acceleration Bay*, 908 F.3d at 773).

Patent Owner also contends that Petitioner:

- (1) “provides no evidence that Goossens2003 was indexed, e.g., by subject matter, such that a skilled artisan would have been able to locate it in the relevant timeframe”;
and

²³ The Response references “EX2080” (Mr. MacPherson’s deposition transcript) rather than “EX2079” (Mr. O’Bryan’s deposition transcript). *See* Resp. 67.

- (2) “does not explain how” a skilled artisan “exercising reasonable diligence” could locate Goossens2003 “via the libraries, e.g., using keyword searching based on subject matter or the like.”

Resp. 67; Sur-reply 28.

4. ANALYSIS

For the reasons explained below, a preponderance of the evidence establishes that Goossens2002 and Goossens2003 are printed publications that were publicly accessible before the ’449 patent’s October 7, 2003, filing date. *See* Ex. 1025 ¶¶ 4–11 & Attach. A; Ex. 1026, 1; Ex. 1027 ¶¶ 4–8 & Attachs. A–B; Ex. 1028, 4; Ex. 1035 ¶¶ 18–52 & Attachs. 1A–1G; Ex. 1038, 1; Ex. 1039, 1, 6, 10–11, 19–21; Ex. 1040, 16–17; Ex. 1042; Ex. 1044 ¶¶ 11–29; Ex. 1046 ¶¶ 10–25; Ex. 1047, 1–7; Ex. 1048, 1–2; Ex. 1051, 1, 10.

(a) The Petition’s Summary of the Evidence Submitted with the Petition

Under the circumstances here, contrary to Patent Owner’s contention, we do not consider the Petition’s short statement about the relevance of the MacPherson declaration (Exhibit 1025), the O’Bryan declaration (Exhibit 1027), and the publisher bibliographic data for Goossens2003 (Exhibit 1028) as rising to the level of improper incorporation by reference. *See* Pet. 8–10; Resp. 64–65; Sur-reply 26–27.

The MacPherson declaration (Exhibit 1025) comprises twelve short paragraphs on two pages. *See* Ex. 1025. The O’Bryan declaration (Exhibit 1027) comprises nine short paragraphs on two pages. *See* Ex. 1027. For these declarations, pinpoint citations to particular paragraphs are unnecessary to discern the significance of the testimony. *See* Inst. Dec.

28–29 (rejecting Patent Owner’s argument about an alleged violation of the Board’s rules).

Additionally, the publisher bibliographic data for Goossens2003 (Exhibit 1028) comprises four pages with the information about the publisher (“Springer New York, NY”) and the publication date (“31 January 2003”) readily locatable on the last page. *See* Ex. 1028.

In any event, the Institution Decision explained that the record at that point “establishe[d] a reasonable likelihood that Goossens2002 and Goossens2003 are printed publications that were publicly available before the ’449 patent’s October 7, 2003, filing date.” Inst. Dec. 28–29. Subsequently, Petitioner submitted additional evidence, and the record now establishes by a preponderance of the evidence that Goossens2002 and Goossens2003 are printed publications that were publicly accessible before the ’449 patent’s October 7, 2003, filing date. *See, e.g.*, Ex. 1035 & Attachs. 1A–1G; Ex. 1038; Ex. 1039; Ex. 1040; Ex. 1042; Ex. 1044; Ex. 1046; Ex. 1047; Ex. 1048; Ex. 1051; *infra* §§ III.D.4(b)–(c).

(b) Goossens2002

For the reasons explained below, we agree with Petitioner that Goossens2002 is a prior-art printed publication. *See* Pet. 8–10; Reply 26–28.

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 explains that his testimony rests on his “personal knowledge and information contained in the business records of IEEE.” *Id.* ¶ 5. Mr. MacPherson also explains 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 also testifies that Goossens2002 was (1) published in the conference proceedings titled “Proceedings 2002 Design, Automation and Test in Europe Conference and Exhibition,” for a conference that 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; *see* Ex. 2080, 21:17–22:9.

Dr. Hall-Ellis testifies that she serves as “an Adjunct Professor in the School of Information at San José State University” and “obtained a Master of Library Science from the University of North Texas in 1972 and a Ph.D. in Library Science from the University of Pittsburgh in 1985.” Ex. 1035 ¶ 6.

Dr. Hall-Ellis explains that IEEE Xplore is:

- (1) familiar to librarians as a “commonly used source of publications”;
- (2) a “scholarly research database” available for electronic searching since “at least early 2002” that now contains 6.5 million documents, including “conference proceedings, ebooks, standards, technical reports, and journal articles, and related documents dating from 1988 to the present”;
- (3) used by “undergraduate and graduate students, researchers, scientists, and the public”;
- (4) “known for its reputable curation and maintenance of documents and publication information”; and
- (5) considered “a reliable source that accurately reports dates of publications and events and accurately reports locations of events in accordance with standard practices for major industry journals.”

Ex. 1046 ¶¶ 12–13, 15–16; *see id.* ¶ 10.

Dr. Hall-Ellis testifies that IEEE Xplore had “conference proceedings indexed (at least by conference title) and available by 2002.” Ex. 1046 ¶ 17. Dr. Hall-Ellis also testifies that IEEE Xplore provided an “accessible source of conference papers” for an ordinarily skilled artisan “exercising reasonable diligence prior to October 2002.” *Id.* ¶ 18.

Further, Dr. Hall-Ellis testifies that various records corroborate Mr. MacPherson’s testimony that the 2002 Design, Automation and Test in Europe Conference and Exhibition took place from March 4 to March 8, 2002. Ex. 1046 ¶¶ 19–25 (citing Ex. 1038; Ex. 1047; Ex. 1048; Ex. 1051). As an example, Dr. Hall-Ellis explains that the U.S. Copyright Office registration for the conference proceedings titled “Proceedings 2002 Design, Automation and Test in Europe Conference and Exhibition” shows that registration occurred on October 3, 2002, and specifies “a publication date of March 4, 2002.” *Id.* ¶ 25 (citing Ex. 1038). Dr. Hall-Ellis also explains that a U.S. Copyright Office registration is “the sort of information that would ordinarily be relied upon by persons in my profession as containing accurate and reliable information, including a reliable indication of the date of publication provided to [the] U.S. Copyright Office by the publisher.” *Id.*

As another example, Dr. Hall-Ellis explains that the U.S. Library of Congress online catalog record for the conference proceedings titled “Proceedings 2002 Design, Automation and Test in Europe Conference and Exhibition” shows that the document “was ‘Published/Created’ by the ‘IEEE Computer Society, 2002’ in ‘Los Alamitos, Calif.’” Ex. 1046 ¶ 23 (quoting Ex. 1048, 1). Dr. Hall-Ellis also explains that the “online catalog record from the Library of Congress and the information contained in it is

the sort of information that would ordinarily be relied upon by persons in my profession as being accurate and reliable.” *Id.*

Dr. Dutt testifies that he obtained “a Ph.D. in Computer Science from the University of Illinois at Urbana-Champaign in 1989,” has “worked for 34 years in the fields of Electrical Engineering and Computer Science,” is “a Fellow of the IEEE,” and has attended “the annual Design, Automation and Test in Europe (DATE) Conference” nearly every year since 1998.

Ex. 1044 ¶¶ 1, 3, 5–7. Dr. Dutt also testifies that he “personally registered for and attended” the DATE 02 conference that took place from March 4 to March 8, 2002, in Paris, France. *Id.* ¶ 11.

Regarding the DATE 02 conference, Dr. Dutt explains that:

- (1) a “copy of all the papers accepted for the DATE 02 conference (either in paper or CD form) was given to conference participants upon registration at the start of the conference, as part of the conference materials”;
- (2) a “copy of the proceedings for DATE 02 was provided to conference participants upon registration at the start of the conference, as part of the conference materials”;
- (3) “I was given a physical copy of the DATE 02 proceedings (either in paper or CD form)” that “included all the papers accepted for that year’s conference”;
- (4) there were “at least 400 to 500 in-person attendees at the DATE 02 conference”;
- (5) each attendee at the DATE 02 conference received a physical copy of the DATE 02 conference proceedings;
- (6) there were “no confidentiality restrictions at the DATE 02 conference, and notetaking was common practice”; and
- (7) the paper titled “Networks on Silicon: Combining Best-Effort and Guaranteed Services” by Kees Goossens et al.

(Goossens2002) was (a) “included in the physical copy of the DATE 02 conference proceedings that was handed out to myself and other participants in the DATE 02 conference at check-in” and (b) presented at a session during the conference.

Ex. 1044 ¶¶ 13–17, 20–23 (citing Ex. 1038; Ex. 1039; Ex. 1040; Ex. 1048).

Further, Dr. Dutt testifies that the “IEEE’s electronic publication service, IEEE Xplore, was also well-known to [skilled artisans] by early 2002” and “easily searchable” for conference proceedings, such as the conference proceedings for DATE 02. Ex. 1044 ¶¶ 25–27 (citing Ex. 1042); *see id.* ¶¶ 28–29. Dr. Dutt explains that “one could pull up a conference by title, and then peruse conference proceedings.” *Id.* ¶ 27.

According to Dr. Dutt, the paper titled “Networks on Silicon: Combining Best-Effort and Guaranteed Services” by Kees Goossens et al. (Goossens2002) was added to IEEE Xplore on August 7, 2002. Ex. 1044 ¶ 26 (citing Ex. 1025; Ex. 1026).

The evidence from Mr. MacPherson, Dr. Hall-Ellis, Dr. Dutt, the IEEE, the U.S. Copyright Office, and the U.S. Library of Congress shows that Goossens2002 was publicly accessible no later than August 7, 2002, i.e., fourteen months before the ’449 patent’s October 7, 2003, filing date, and probably publicly accessible as early as March 4, 2002, when distributed without restriction to 400 to 500 conference attendees. *See* Ex. 1025 ¶¶ 4–11 & Attach. A; Ex. 1026, 1; Ex. 1038, 1; Ex. 1044 ¶¶ 11–29; Ex. 1046 ¶¶ 10–25; Ex. 1048, 1–2; *see also* Ex. 1039, 1, 6, 10–11, 19–21; Ex. 1040, 17; Ex. 1047, 1–7; Ex. 1051, 1, 10.

Additionally, as noted above, “[w]hen there is an established publisher there is a presumption of public accessibility as of the publication

date.” *VidStream*, 981 F.3d at 1065; *see supra* § III.D.1. The evidence from Mr. MacPherson, Dr. Hall-Ellis, and Dr. Dutt shows that the IEEE is an established publisher. *See* Ex. 1025 ¶¶ 6–7; Ex. 1044 ¶¶ 24–25; Ex. 1046 ¶¶ 11–18. Thus, “there is a presumption of public accessibility as of the publication date,” i.e., August 7, 2002. *See VidStream*, 981 F.3d at 1065. Patent Owner does not rebut that presumption by (1) faulting Mr. MacPherson and Dr. Dutt for lacking personal knowledge and (2) referencing the IEEE’s “terms of service.” *See* Resp. 65–66; Sur-reply 28.

Moreover, Mr. MacPherson provides competent testimony about the IEEE’s routine business practices. *See* Ex. 1025 ¶¶ 5–7, 9–10; Ex. 2080, 21:17–22:9. “The probative value of routine business practice to show the performance of a specific act has long been recognized.” *Hall*, 781 F.2d at 899.

Patent Owner characterizes Petitioner’s assertion about a “presumption of public accessibility as of the publication date” as an “improper new theory.” Sur-reply 28; *see* Reply 27. But Samsung made the same assertion in preinstitution briefing. *See* Prelim. Reply 1–2. Also, Petitioner’s assertion about a “presumption of public accessibility as of the publication date” properly responds to Patent Owner’s argument about the alleged insufficiency of the evidence from Mr. MacPherson. *See* Resp. 65–66; Reply 27; 37 C.F.R. § 42.23(b).

(c) Goossens2003

For the reasons explained below, we agree with Petitioner that Goossens2003 is a prior-art printed publication. *See* Pet. 8–10; Reply 24–25.

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 testifies that the book titled "Networks on Chip" edited by Axel Jantsch and Hannu Tenhunen (Kluwer Academic Publishers 2003), which includes Goossens2003 as chapter 4, is "in the UT Libraries' collection" and was "catalogued on April 16, 2003." *Id.* ¶ 5. Mr. O'Bryan also 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. Mr. O'Bryan provides competent testimony about the general library practice at the UT Libraries. *See id.* ¶¶ 2–5, 7; *Hall*, 781 F.2d at 899.

Additionally, Mr. O'Bryan's declaration attaches certain pages from the book titled "Networks on Chip," including a page containing (1) the column heading "Due" on the left with hand-stamped dates under that heading and (2) the column heading "Returned" on the right with hand-stamped dates under that heading. Ex. 1027, 4–10 (Attach. B); *see* Ex. 2079, 21:9–21. The first hand-stamped date under the column heading "Due" reads "AUG 27 2003." Ex. 1027, 6; Ex. 2079, 21:25–22:3. Consistent with Mr. O'Bryan's testimony that "the UT Libraries typically made newly catalogued items available to the public within 3 business days of cataloging," i.e., "within 3 business days of" April 16, 2003, the hand-stamped date "AUG 27 2003" indicates that the book was available and checked out of the UT Libraries before August 27, 2003. *See* Ex. 1027 ¶¶ 5, 7.

Dr. Hall-Ellis describes an industry-wide library cataloging standard developed by the Library of Congress known as MARC (MAchine-Readable Cataloging). *See* Ex. 1035 ¶¶ 18–23. Dr. Hall-Ellis explains that a MARC record for a cataloged item contains various data fields identified by three-digit field codes, including data fields with the following information:

- (1) the primary author;
- (2) the publication date;
- (3) the library creating the record;
- (4) the date the library created the record;
- (5) an International Standard Book Number (ISBN);
- (6) a subject-matter classification used to “provide access according to generally accepted thesaurus-building rules”; and
- (7) a call number with further classification information, e.g., a Library of Congress Call (LCC) Number and/or a Dewey Decimal Call (DDC) Number.

See id. ¶¶ 24–26, 29.

Dr. Hall-Ellis explains that the Online Computer Library Center (OCLC) and its member institutions maintain an online bibliographic database of MARC records. Ex. 1035 ¶¶ 27–28. Dr. Hall-Ellis also explains that once a MARC record for an item has been “created by a cataloger at an OCLC member institution or is tape-loaded from the Library of Congress or another library anywhere in the world,” a publication “corresponding to the MARC record has been cataloged and indexed according to its subject matter such that a person interested in that subject matter could, with reasonable diligence, locate and access the publication through any library

with access to the OCLC bibliographic database or through the Library of Congress.” *Id.* ¶ 28.

Regarding the book titled “Networks on Chip” edited by Axel Jantsch and Hannu Tenhunen (Kluwer Academic Publishers 2003), Dr. Hall-Ellis testifies that the OCLC bibliographic database of MARC records shows that the book “arrived in the Library of Congress on April 7, 2003,” and “exited the cataloging process on May 12, 2003.” Ex. 1035 ¶¶ 41–44 & Attach. 1G. Dr. Hall-Ellis also testifies that the book (1) was present and “cataloged and indexed” in “the Library of Congress on May 12, 2003,” and (2) “would have been able to be located by a person of ordinary skill in the art using the library catalog system and was thus publicly accessible as of this date.” *Id.* ¶¶ 44, 47, 52.

Further, Dr. Hall-Ellis testifies that Goossens2003 “was published and accessible to the public no later than May 12, 2003,” since Goossens2003 is included as chapter 4 in the book titled “Networks on Chip.” Ex. 1035 ¶¶ 48–49.

The evidence from Mr. O’Bryan and Dr. Hall-Ellis shows that Goossens2003 was publicly accessible no later than May 12, 2003, i.e., almost five months before the ’449 patent’s October 7, 2003, filing date. *See* Ex. 1027 ¶¶ 4–8 & Attachs. A–B; Ex. 1035 ¶¶ 18–52 & Attachs. 1A–1G. The publisher bibliographic data for Goossens2003 corroborates the evidence from Mr. O’Bryan and Dr. Hall-Ellis. *See* Ex. 1028, 4.

Patent Owner’s contention that the declarations from Mr. O’Bryan and Dr. Hall-Ellis “show mere ‘technical accessibility’ at a library” lacks merit. *See* Sur-reply 28. The Federal Circuit has held that a doctoral thesis indexed and shelved in one university library was sufficiently accessible to

the public to constitute a printed publication. *Hall*, 781 F.2d at 899. The evidence from Mr. O’Bryan and Dr. Hall-Ellis shows that Goossens2003 was “cataloged and indexed,” e.g., by subject matter, in at least two libraries and not merely “technically accessible.” *See* Ex. 1027 ¶¶ 4–8 & Attachs. A–B; Ex. 1035 ¶¶ 18–49 & Attachs. 1A–1G.

Further, for the doctoral thesis indexed and shelved in one university library, the Federal Circuit did not require evidence about how a skilled artisan “exercising reasonable diligence” could locate the doctoral thesis using the library information system. *Hall*, 781 F.2d at 899–900. Hence, Patent Owner’s contention that Petitioner “does not explain how” a skilled artisan “exercising reasonable diligence” could locate Goossens2003 “via the libraries” does not undermine the evidence of public accessibility. *See* Sur-reply 28.

Additionally, Dr. Hall-Ellis testifies that the book titled “Networks on Chip” “would have been able to be located by a person of ordinary skill in the art using the library catalog system.” Ex. 1035 ¶ 44. Patent Owner identifies no evidence refuting that testimony. *See* Resp. 67–68; Sur-reply 28–29.

*E. Alleged Obviousness over Goossens2003
and Drake: Claims 2, 6, and 9–16*

Petitioner contends that claims 2, 6, and 9–16 are unpatentable under § 103(a) because the claims would have been obvious over Goossens2003 and Drake. *See* Pet. 10, 51–71; Reply 3–21. Patent Owner disputes Petitioner’s contentions. *See* Resp. 6–8, 17–20, 45–64; Sur-reply 2–26.

Below, we provide overviews of Goossens2003 and Drake. Then, we consider the obviousness issues. For the reasons explained below, we agree

with Petitioner that claims 2, 6, and 9–16 are unpatentable under § 103(a) because the claims would have been obvious over Goossens2003 and Drake.

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;²⁴ Ex. 1027 ¶¶ 5–7; Ex. 1035 ¶¶ 41–49. 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’s “services largely define the platform.” *Id.* at 66. Also, the NoC’s “services aid in decoupling applications and architectures.” *Id.*; *see id.* at 78. For instance, network interfaces (NIs) “bridge the network layer and transport layer” and convert “network layer services of the routers to transport layer services for the user.” *Id.* at 74, 76.

Goossens2003 describes the Æthereal NoC that contains routers and network interfaces and provides guaranteed services for “real-time 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

²⁴ For Exhibit 1007 (Goossens2003), we follow Petitioner’s practice and cite to the page numbers that appear in the publication.

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 *Æ*thereal 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 a “negotiation phase” of a “resource management” process by “stating the requested service level,” i.e., with an IP’s 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 *Æ*thereal NoC, the NoC “either accepts or rejects the request for the connection.” Ex. 1007, 71. The NoC “will honour the request if [the NoC] has sufficient resources available, and will reject it otherwise.” *Id.* at 67. Accepting the request for the connection may lead to “resource reservations” in the NoC. *Id.* at 71. 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 *Æ*thereal 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:

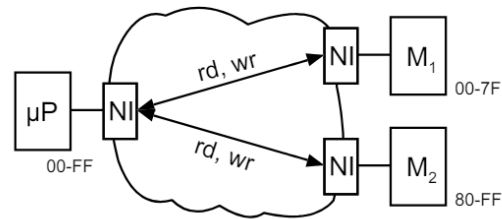
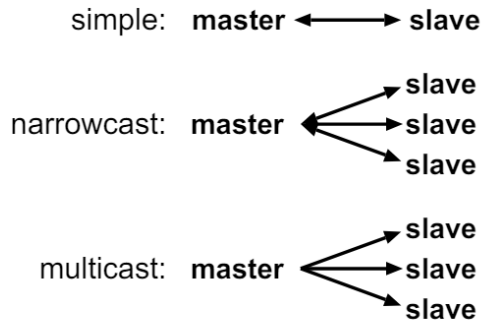


Figure 4.5. A narrowcast connection.

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 ” (microprocessor) and two slaves identified as “ M_1 ” (memory module 1) and “ M_2 ” (memory module 2) together with a network interface (NI) associated with each of the three processing modules. *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 (a) “the master sends a request,” (b) “a slave

receives the request and executes it,” (c) “the slave sends the response,” and (d) “the master receives the response”;

- (3) transaction completion stipulating that transactions requesting a response “guarantee that the master always receives a response” containing either (a) “a report that the request was not delivered to the slave,” (b) “the response of the slave, after it successfully executed the request,” (c) “a notification that the slave successfully executed the request, but the response was dropped,” or (d) “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 “has not been reserved or is not used by GT traffic.” *Id.* “This allows the sharing of links and data path.” *Id.*

Goossens2003 explains that “users can be given a predictable QoS by giving resource management and QoS a prominent place in system design.” Ex. 1007, 65.

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. Also, “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.” Ex. 1006, code (57); *see id.* at 2:26–41. The QoS management system is “attached to the network and receives requests from all other stations on the network to reserve facilities for a particular quality of service data stream.” *Id.* at code (57); *see id.* at 2:65–3:1. In the QoS management system, an allocator “determines if the requested facilities are available and, if so, reserves these facilities for the requesting station.” *Id.* at code (57); *see id.* at 4:50–55. “If the facilities are not available, the request is denied.” *Id.* at code (57); *see id.* at 2:18–21, 4:55–57.

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

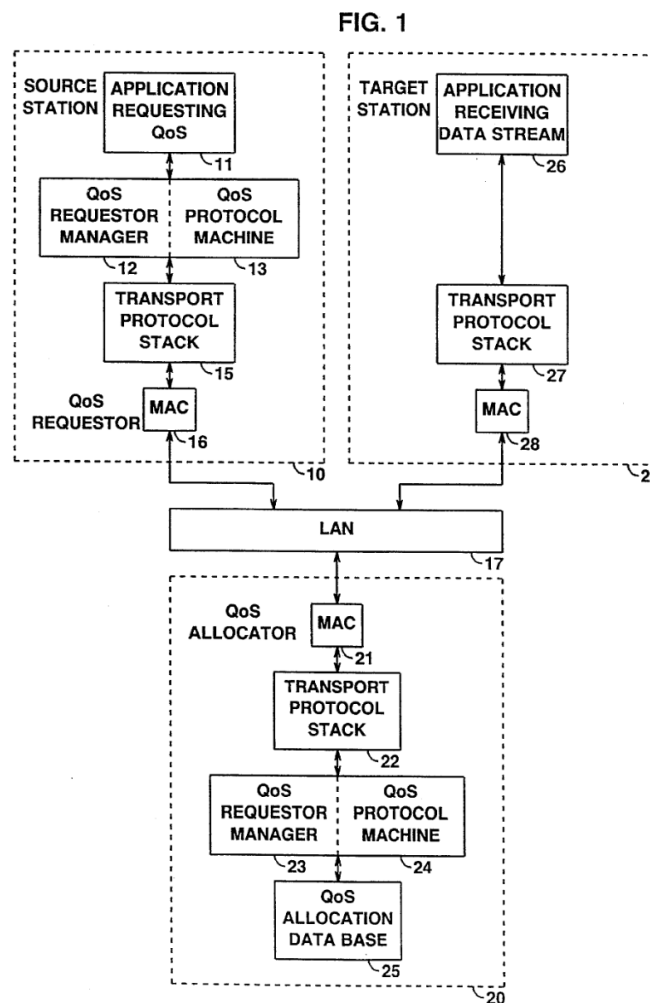


Figure 1 illustrates a QoS management system including source station 10, QoS allocator 20, and target station 29 connected to one another by local area network (LAN) 17. Ex. 1006, 3:36–40, 4:18–26, Fig. 1. QoS allocator 20 “implements a quality of service management process for LAN 17.” *Id.* at 4:23–26; *see id.* at 4:50–57. QoS allocator 20 “manages the QoS requests for the entire LAN 17.” *Id.* at 4:66–67; *see id.* at code (57).

As shown in Figure 1, source station 10 includes application 11 that “requests a QoS connection to the destination or target station 29,” e.g., a QoS connection for a multimedia data stream. Ex. 1006, 4:27–31, Fig. 1. Application 11 “may simply be a file server application” that “causes multimedia data to be transported from a multimedia data base to LAN 17.” *Id.* at 4:58–60; *see id.* at 10:11–15.

As shown in Figure 1, source station 10 also includes QoS requestor manager 12 and QoS protocol machine 13. Ex. 1006, 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.

As shown in Figure 1, source station 10 additionally includes transport protocol stack 15 for formatting a request packet and medium access control (MAC) entity 16 for launching the request packet on LAN 17. Ex. 1006, 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 3:14–20, 3:41–43, 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, code (57). For instance, “the stored component parameters are consulted to determine if the components in the selected path, individually and together, satisfy the requested QoS values for a multimedia transmission.” *Id.* at 2:37–40.

“If the QoS exists, it is assigned to this QoS data stream.” Ex. 1006, 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.

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.”

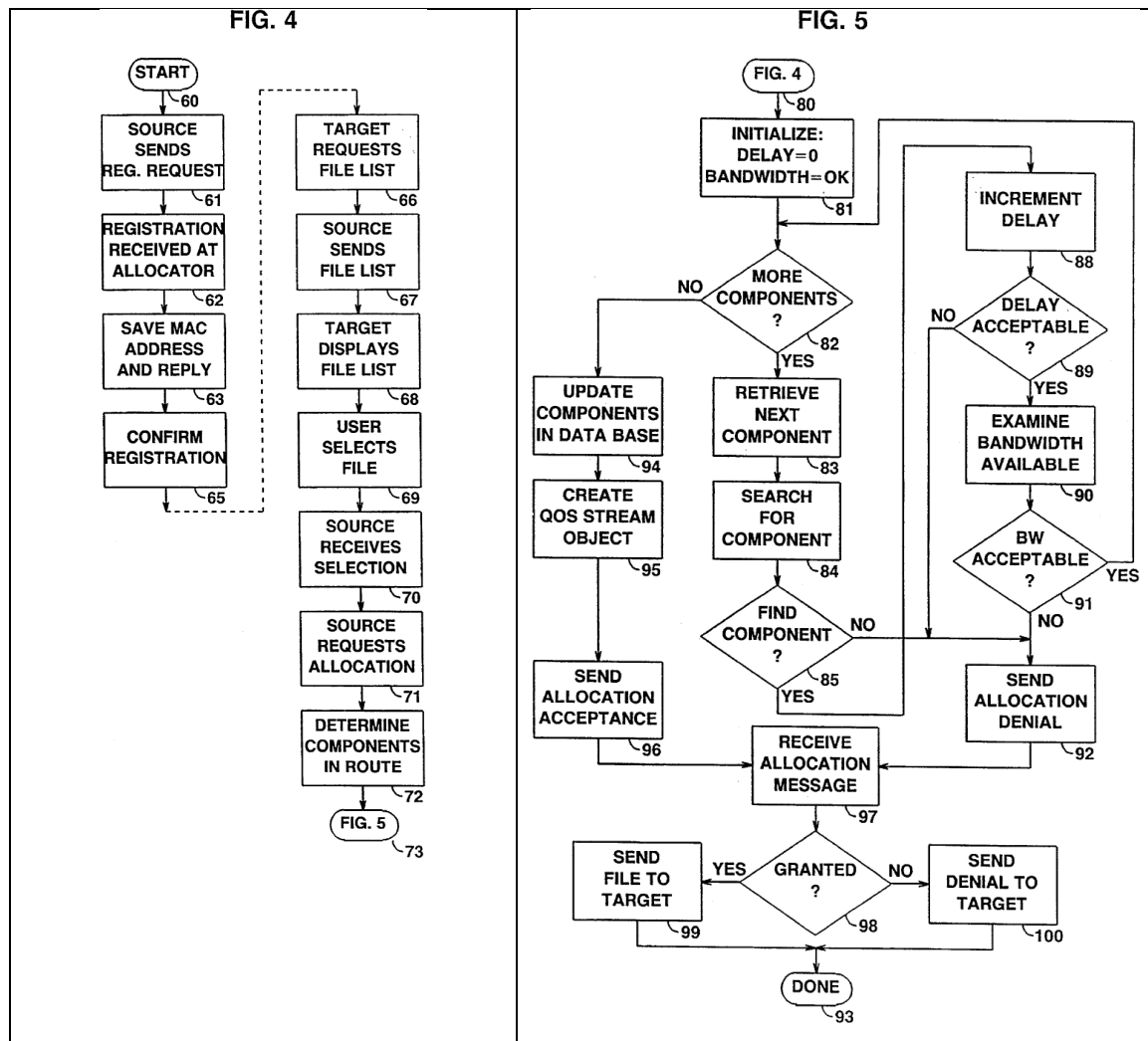
Ex. 1006, 5:51–6:28.

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;
- QoS allocation change request; and
- QoS change reply.

Ex. 1006, 8:20–29; *see id.* at 3:21–28, 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 QoS 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. WHETHER AN ORDINARILY SKILLED ARTISAN WOULD
HAVE BEEN MOTIVATED TO COMBINE THE TEACHINGS OF
THE REFERENCES WITH A REASONABLE EXPECTATION OF SUCCESS

(a) Petitioner’s Contentions in the Petition

(i) Motivation to Combine

Petitioner contends that an ordinarily skilled artisan would have been motivated to combine Drake’s QoS teachings with Goossens2003’s teachings to (1) “obtain the benefits of Drake’s known solution to ensuring the availability of network resources for guaranteed services” using QoS requestor manager 12 (mapped to the claimed “communication manager”) and QoS allocator 20 (mapped to the claimed “resource manager”) and (2) “create an SoC with improved performance and efficiency.” Pet. 51–53, 63 (citing Ex. 1003 ¶¶ 156–166, 187).

Petitioner contends that Goossens2003 discloses an SoC with an NoC that (1) provides communications between intellectual property blocks (IPs) in the SoC and (2) “offers guaranteed services to obtain the advantages” of a QoS-based design for “real-time and critical functions.” Pet. 51 (citing

Ex. 1007, 61, 63, 71, 74). Petitioner contends that Goossens2003's SoC includes network interfaces (NIs) that "translate between the 'transport layer' utilized by the IPs to request services and the 'network layer' utilized by" the NoC's routers to transport data. *Id.* at 67 (citing Ex. 1007, 74–75); *see id.* at 62. Petitioner contends that Goossens2003's IPs "negotiate with network interfaces to obtain connections with certain properties" and reserve network resources. *Id.* at 62, 65, 67 (quoting Ex. 1007, 77).

Petitioner contends that Goossens2003 explains that implementing connections in an NoC requires "resource management" but "does not describe a specific component or mechanism" in the NoC for (1) "tracking resource usage," (2) "managing resource usage," or (3) "determining the availability of the resources required for a requested connection." Pet. 51, 57 (citing Ex. 1003 ¶¶ 157–159; Ex. 1007, 65, 68–69, 74).

Petitioner contends that Drake concerns "the same goal of managing network resources" to "ensure[] selected levels of quality of services." Pet. 51 (alteration by Petitioner) (quoting Ex. 1006, code (57)). Petitioner contends that Drake discloses a QoS management process where:

- (1) a QoS requestor manager "formulate[s] requests for guaranteed services with particular properties"; and
- (2) a QoS allocator "determine[s] whether the network resources required for the requested services are available."

Id. at 52 (citing Ex. 1006, 2:14–40, 4:17–46). According to Petitioner, an ordinarily skilled artisan "would have looked to Drake's disclosures" for "details regarding the implementation of resource management" in Goossens2003's NoC. *Id.* at 58, 62 (citing Ex. 1003 ¶¶ 156–166, 173, 183).

Petitioner asserts that an ordinarily skilled artisan “would have understood that using Drake’s QoS management process would improve the performance and efficiency” of Goossens2003’s NoC by “ensuring that connections established by IPs are able to provide the required services.” Pet. 52. As an example, Petitioner explains that Drake’s QoS management process denies network access to “those streams whose level of quality of service requirements are not currently available.” *Id.* (quoting Ex. 1006, 2:18–20).

Petitioner further asserts that an ordinarily skilled artisan “would have been motivated to implement the functionality” of Drake’s QoS allocator 20 as “a circuit on the same integrated circuit chip” as Goossens2003’s NoC and IPs. Pet. 58 (citing Ex. 1003 ¶ 175). Petitioner explains that the “hallmark” of an SoC as disclosed in Goossens2003 “is that the components of the system are included on the same chip, and the nature of Drake’s QoS allocator—which manages the resources of the network and intermediates communications between functional blocks—requires that it be tightly integrated with those components.” *Id.* (citing Ex. 1003 ¶ 175).

(ii) Reasonable Expectation of Success

Petitioner asserts that an ordinarily skilled artisan would have had “a reasonable expectation of success in combining the disclosures of Goossens2003 and Drake” because “doing so merely combines prior art elements according to known methods to yield predictable results.” Pet. 52 (citing Ex. 1003 ¶ 164); *see id.* at 58. Petitioner explains that both Goossens2003 and Drake (1) address “the same field of data communication in packet-based networks” and (2) are “directed to ensuring that sufficient resources are available for the communication of multimedia content, such

as audio and video.” *Id.* at 53 (citing Ex. 1006, 1:22–24; Ex. 1007, 62). Therefore, according to Petitioner, an ordinarily skilled artisan “would have reasonably expected that use of Drake’s known solution to ensuring the availability of network resources for guaranteed services would improve” Goossens2003’s NoC in the same way. *Id.* (citing Ex. 1003 ¶ 164).

Additionally, Petitioner asserts that an ordinarily skilled artisan would have understood that:

- (1) “Drake’s disclosure is applicable to networks on chip, including because certain resources are more limited in the on-chip context and need to be managed carefully”;
- (2) “mature networking technologies like those described by Drake could be usefully applied in the context of” an NoC;
- (3) Drake’s QoS management process is well suited for a resource-constrained, on-chip environment; and
- (4) Drake’s QoS management process would “more efficiently utilize” an NoC’s resources and “minimize their waste.”

Pet. 53 (citing Ex. 1003 ¶¶ 165–166; Ex. 1007, 65).

As support, Petitioner asserts that the ’449 patent “describes that many issues that arise when using networks for on-chip communication ‘have been already the subject of research in the field of local and wide area networks’” and “further describes that such networks are ‘very much related to on chip networks, and many of the results in those fields are also applicable on chip.’” Pet. 53–54 (quoting Ex. 1001, 1:61–62, 1:64–66).

(b) Patent Owner's Contentions in the Response

(i) Motivation to Combine

Patent Owner disputes that an ordinarily skilled artisan would have been motivated to combine Drake's QoS teachings with Goossens2003's teachings to yield the claimed inventions. *See* Resp. 46–60. In particular, Patent Owner contends that Petitioner “argues that select components and functions of Drake's QoS management system would be implemented in Goossens2003” but “fails to explain specifically why and how those aspects of Drake's QoS system would purportedly be incorporated into and work with Goossens2003.” *Id.* at 46 (emphases omitted); *see id.* at 46–47, 54.

Patent Owner contends that Petitioner fails to explain:

- (1) why an ordinarily skilled artisan would have implemented Drake's QoS requestor manager 12 in Goossens2003;
- (2) where an ordinarily skilled artisan would have implemented Drake's QoS requestor manager 12 in Goossens2003, e.g., in the IPs, in the NoC, or elsewhere; and
- (3) how Drake's QoS requestor manager 12 “would work with Goossens2003.”

Id. at 47, 49–51, 57 (citing Pet. 51–54, 62–63).

Patent Owner explains that where an ordinarily skilled artisan would have implemented Drake's QoS requestor manager 12 in Goossens2003 “matters because Goossens2003 and Drake contain contradictory teachings with respect to where communication components should be implemented relative to a network.” Resp. 58; *see id.* at 50–51. According to Patent Owner, “Goossens2003 teaches that components involved in communication, like Drake's QoS requestor manager, should not be

implemented in an IP block, whereas Drake teaches that the QoS requestor manager should not be implemented in a network.” *Id.* at 51 (emphases omitted).

Patent Owner asserts that it sought to clarify the “ambiguity” about where an ordinarily skilled artisan would have implemented Drake’s QoS requestor manager 12 in Goossens2003 during Dr. Mowry’s first deposition. Resp. 53. Patent Owner asserts that Dr. Mowry:

- (1) initially was “evasive” as to where Drake’s QoS requestor manager 12 would have been implemented in Goossens2003; and
- (2) “eventually testified” that Drake’s QoS requestor manager 12 “can go ‘anywhere on the chip’ in Goossens2003” provided that there is a connection to the NoC.

Id. (emphasis omitted) (citing Ex. 2078, 203:10–209:13, 209:22–211:25, 233:4–234:1).

Additionally, Patent Owner contends that Petitioner fails to explain why Drake’s QoS requestor manager 12 and Drake’s QoS allocator 20 “are purportedly needed for resource management in Goossens2003 rather than a single component.” Resp. 47. Patent Owner contends that Petitioner fails to explain why an ordinarily skilled artisan would have looked to Drake’s QoS requestor manager 12 to formulate “requests for guaranteed services with particular properties” when “Goossens2003 purportedly already teaches such requests.” *Id.*

Further, Patent Owner asserts that an ordinarily skilled artisan “would not have been motivated” to include Drake’s QoS requestor manager 12 in Goossens2003 because QoS requestor manager 12 would have been “redundant.” Resp. 49 (citing Ex. 2070 ¶¶ 252–265); *see id.* at 56.

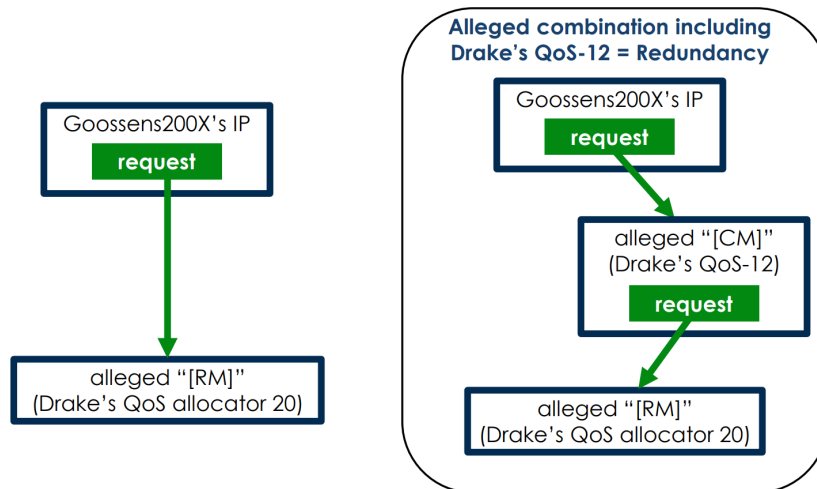
Regarding the alleged redundancy, Patent Owner explains that Drake's QoS requestor manager 12 and Goossens2003's IPs "both purportedly make a request for a connection with sufficient properties." *Id.* at 49 (citing Ex. 1006, 4:32–37; Ex. 1007, 77; Ex. 2070 ¶ 254; Ex. 2078, 190:19–191:14).

According to Patent Owner, an ordinarily skilled artisan "looking to implement Drake's QoS system in Goossens2003":

- (1) would have had "no need" and "no reason" to include Drake's QoS requestor manager 12 in Goossens2003's SoC since Goossens2003's IPs "already generate a connection request and send it to the alleged 'resource manager' without Drake's QoS requestor manager"; and
- (2) would have understood that "the alleged 'resource manager' (i.e., Drake's QoS allocator) would have received the request directly from, and provided its response to, Goossens2003's IP, not a QoS requestor manager."

Resp. 49–50, 56, 59–60 (citing Ex. 1006, 4:50–52, 11:22–38, 14:22–27; Ex. 2070 ¶¶ 254, 273; Ex. 2078, 190:19–191:14, 152:1–12, 153:11–18, 173:8–11, 201:1–5; Pet. 26–27, 31–32, 34, 59, 61).

Patent Owner provides the following illustration to show the alleged redundancy:



The above illustration depicts two paths between Goossens2003's IP and Drake's QoS allocator 20 for a service request from the IP. Ex. 2089, 33. The path on the left shows a service request going from the IP directly to QoS allocator 20. *Id.* The path on the right shows a service request going from the IP to QoS requestor manager 12 and then to QoS allocator 20. *Id.* For the path on the right, the above illustration includes the annotation "Alleged combination including Drake's QoS-12 = Redundancy." *Id.*

Regarding Petitioner's contention concerning obtaining the benefits of Drake's known solution to "ensuring the availability of network resources for guaranteed services," Patent Owner asserts that "Goossens2003 already describes this." Resp. 50 (citing Ex. 1007, 61, 65, 70–71, 78–79). According to Patent Owner, an ordinarily skilled artisan would not have been "motivated to modify Goossens2003 to purportedly obtain a benefit that is already achieved by Goossens2003." *Id.*

Patent Owner asserts that "on-chip and off-chip networks have different premises" and that "off-chip network designs [are] inapplicable to

on-chip networks.” Resp. 7, 51 (citing Ex. 1001, 3:15–17; Ex. 2070 ¶ 102); *see id.* at 6–8, 54–55. According to Patent Owner, Goossens2003 and Drake have “fundamentally different architectures” and teach “completely opposite solutions” because:

- (1) Drake’s QoS management “is specifically directed to local area networks (LANs)”;
- (2) Drake’s QoS components “are attached to, but not implemented within, the network”;
- (3) “Drake is premised on its QoS components being implemented in stations attached to networks, so that the network stays the same”;
- (4) Goossens2003 “teaches that components involved in communication must be decoupled from computational components”; and
- (5) “Goossens2003 is premised on implementing such communication components within the network, so that the IPs stay the same.”

Id. at 51, 54–55 (citing Ex. 1006, 1:6–11, 1:13–2:21, 2:25–3:29, 3:31–4:10, 4:18–26, 4:32–47, 4:62–5:4, 14:17, 15:39–46, code (57), Fig. 1; Ex. 1007, 65–66, 78; Ex. 2070 ¶¶ 242–243, 255; Ex. 2078, 138:5–11, 140:1–141:7, 142:21–143:7, 150:8–151:21, 189:1–190:3). Patent Owner explains that decoupling communication components from computational components permits the respective components “to be designed independently from each other.” *Id.* at 6, 15 (emphasis omitted) (citing Ex. 1001, 17:60–65; Ex. 2070 ¶¶ 91, 118).

Patent Owner contends that Petitioner fails to explain where Drake’s QoS allocator 20 (mapped to the claimed “resource manager”) would “purportedly receive requests from in the alleged combination with

Goossens2003,” e.g., from the IPs or from “somewhere else.” Resp. 54 (citing Pet. 61–62).

Further, Patent Owner asserts that Goossens2003 “teaches away” from including Drake’s QoS requestor manager 12 in an IP because “Goossens2003 is emphatic that its IPs should not contain communication components” like Drake’s QoS requestor manager 12 so that the IPs “can be reused and designed independently from the network.” Resp. 51–52 (emphasis omitted) (citing Ex. 1007, 65–66, 78; Ex. 2078, 189:1–190:3). Patent Owner also asserts that Drake “teaches away” from including QoS requestor manager 12 in a network because QoS requestor manager 12 “is purposefully within source station 10 rather than within the LAN.” *Id.* at 52 (citing Ex. 1006, 2:57–3:3; Ex. 2070 ¶ 264).

Additionally, Patent Owner contends that Petitioner fails to explain for claims 6 and 10 “why or how Goossens2003 would be modified or work with Drake’s teachings” to yield the claimed inventions. Resp. 55, 60 (citing Pet. 65–67, 69–70); *see id.* at 55–60.

(ii) Reasonable Expectation of Success

Patent Owner asserts that an ordinarily skilled artisan “under Petitioner’s definition” would not have had a reasonable expectation of success in combining Drake’s QoS teachings with Goossens2003’s teachings because:

- (1) “Drake teaches that it would be complex to implement QoS in the network”; and
- (2) it would be “more complex to implement” Drake’s QoS requestor manager 12 in Goossens2003’s NoC than in Drake’s network.

Resp. 52 (citing Ex. 1006, 2:57–3:3; Ex. 2070 ¶ 264).

(c) Petitioner's Contentions in the Reply

(i) Motivation to Combine

Petitioner contends that Patent Owner misapprehends the proposed combination because the proposed combination implements Drake's QoS management process in Goossens2003. Reply 1 (citing Inst. Dec. 66, 85); *see id.* at 10. Petitioner explains that Goossens2003's SoC includes "QoS functionality located outside of the IP modules." *Id.* at 2. Petitioner also explains that in the proposed combination the QoS components from Drake's QoS management system, such as Drake's QoS requestor manager 12 (mapped to claimed "communication manager"), "would still be in the location described in Goossens," i.e., outside of the IP modules. *Id.*; *see id.* at 16–17.

Therefore, according to Petitioner, an ordinarily skilled artisan would have implemented Drake's QoS requestor manager 12 (mapped to the claimed "communication manager") in Goossens2003's SoC at a location outside of the IP modules (mapped to the claimed "first module" and the claimed "second module"). Reply 4, 16–17 (citing Ex. 1043 ¶¶ 27, 29, 46, 72–77; Inst. Dec. 66, 85).

Petitioner contends that Dr. Mowry "confirmed at his deposition that he was focusing on" application 11 in source station 10 as the "thing" in Drake that initially requests a QoS connection because "that is the component Drake teaches makes the service request." Reply 3–4 (citing Ex. 1006, 4:27–29; Ex. 2078, 171:21–176:3).

Regarding Patent Owner's assertion that "on-chip and off-chip networks have different premises," Petitioner contends that an ordinarily skilled artisan "working with on-chip networks" would have "looked to" and

been “motivated by” off-chip network technology. Reply 6 (citing Ex. 1003 ¶¶ 30–34, 163–166). As support, Petitioner quotes the ’449 patent’s explanation that “large-scale networks are ‘very much related to on-chip networks, and many of the results in those fields are also applicable on chip.’” *Id.* at 5–6 (emphasis omitted) (quoting Ex. 1001, 1:64–66).

Regarding Patent Owner’s contentions concerning inadequate detail about the proposed combination in the Petition, Petitioner asserts that the grounds are clear. Reply 6. Petitioner asserts that the Petition explains as follows:

- (1) Goossens2003 discloses an SoC with an NoC and “the importance of managing network resources to provide guaranteed services”;
- (2) Goossens2003 “does not describe a component or mechanism” in the NoC for either “managing resource usage” or “determining the availability of the resources required” for a requested connection; and
- (3) Drake discloses “a beneficial QoS management process” with QoS requestor manager 12 corresponding to the claimed “communication manager” and QoS allocator 20 corresponding to the claimed “resource manager” that would have “improv[ed] the efficiency and performance” of Goossens2003’s NoC by “ensuring the connections were able to provide the required guaranteed services.”

Id. (alteration by Petitioner) (citing Pet. 51–54; Ex. 1003 ¶¶ 160–163).

Petitioner asserts that the Petition’s explanation suffices because “a determination of obviousness based on teachings from multiple references does not require an actual, physical substitution of elements.” Reply 7 (quoting *In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012)).

Regarding Patent Owner’s argument that including Drake’s QoS requestor manager 12 in Goossens2003 would have been “redundant,” Petitioner asserts that:

- (1) Goossens2003 lacks details about specific components for implementing QoS functionality;
- (2) that lack of detail in Goossens2003 would have motivated an ordinarily skilled artisan to “look to a reference such as Drake” and “follow Drake’s teaching of including a communication manager [Drake’s QoS requestor manager 12] in the network interface to facilitate communication with the resource manager [Drake’s QoS allocator 20]”; and
- (3) an ordinarily skilled artisan would have implemented Drake’s QoS functionality in Goossens2003 using Drake’s QoS requestor manager 12 “rather than modify Drake further.”

Reply 8, 15 (citing Ex. 1043 ¶¶ 23, 44, 50–52, 64–67).

Petitioner also asserts that “Drake’s description of QoS allocator 20 communicating with ‘source station 10’ is not somehow motivation to change Drake’s data path (which shows using QoS requestor manager 12).” Reply 15 (emphasis omitted) (citing Ex. 1043 ¶¶ 68–71).

Additionally, Petitioner contends that Patent Owner’s “redundancy” argument “ignores the known need for interfacing components in both off-chip and on-chip networks.” Reply 9 (citing Ex. 1043 ¶¶ 25–29, 51–52). Petitioner contends that an ordinarily skilled artisan would have known that Goossens2003’s NoC would desirably include interfacing components like Drake’s QoS requestor manager 12 (mapped to the claimed “communication manager”) because:

- (1) different “re-use[d]” IPs as disclosed in Goossens2003 “typically used different protocols to describe the type of service” for communicating data;
- (2) Goossens2003 discloses providing communication-management functionality in a network interface of the NoC, i.e., outside of the IPs; and
- (3) Drake’s QoS requestor manager 12 is a “specific example” of a component providing communication-management functionality.

Id. at 9–10, 12–13 (alteration by Petitioner) (citing Ex. 1003 ¶¶ 118–122, 185–187; Ex. 1006, 4:34–35; Ex. 1007, 76–77; Ex. 1043 ¶¶ 15, 28–29, 48, 50–53; Ex. 2078, 203:24–204:9). According to Petitioner, this is “more evidence” that an ordinarily skilled artisan would have been motivated to use Drake’s “communication manager component,” i.e., QoS requestor manager 12, to implement the communication-management functionality “already taught by Goossens2003.” *Id.* at 9 (citing Ex. 1043 ¶ 48).

Petitioner asserts that an ordinarily skilled artisan would have known that in Goossens2003’s on-chip context the “equivalent place for QoS interfacing components” like Drake’s QoS requestor manager 12 (mapped to the claimed “communication manager”) is outside of the IPs, e.g., in a network interface of the NoC. Reply 12 (citing Ex. 1037, 80:25–81:3, 95:13–22, 103:6–11, 103:24–104:14; Ex. 1043 ¶¶ 61–62). Petitioner asserts that an ordinarily skilled artisan would have recognized that “Drake’s QoS requestor manager 12 was part of Drake’s network interface.” *Id.* (citing Ex. 1006, 4:34–35; Ex. 1043 ¶ 28).

Petitioner disputes that during Dr. Mowry’s first deposition he was “evasive” as to where Drake’s QoS requestor manager 12 would have been implemented in Goossens2003. Reply 13 n.5. According to Petitioner,

Dr. Mowry testified that Drake's QoS requestor manager 12 "is shown in the network interface, and that would be the 'natural place to put it' in Goossens." *Id.* (citing Ex. 2078, 203:24–204:9); *see id.* at 10. Petitioner explains that as "is evident from the transcript, the subsequent testimony [Patent Owner] cites resulted from Dr. Mowry (mis)understanding that [Patent Owner's] counsel was asking instead about the resource manager." *Id.* at 13 n.5 (emphasis omitted) (citing Ex. 1043 ¶¶ 155–157).

Regarding Patent Owner's contention that Petitioner fails to explain where Drake's QoS allocator 20 (mapped to the claimed "resource manager") would "purportedly receive requests from in the alleged combination with Goossens2003," Petitioner explains that the proposed combination:

- (1) includes Drake's QoS allocator 20 implemented as "a centralized unit anywhere on the chip connected to the network, just as Drake shows it connected to the LAN ('on the LAN')"; and
- (2) "itself shows where" Drake's QoS allocator 20 would receive service requests from, i.e., from "Goossens2003's IP module (the unit making the request) through Drake's QoS requestor manager 12 (data path shown in Drake)."

Reply 11–12, 14 (citing Ex. 1003 ¶ 173; Ex. 1043 ¶¶ 43–45, 55, 117; Ex. 2078, 212:20–213:3; Pet. 61–62).

Regarding Patent Owner's contentions concerning Goossens2003 and Drake each teaching away from the proposed combination, Petitioner asserts that Goossens2003 discloses providing communication-management functionality in a network interface of the NoC, i.e., outside of the IPs. Reply 9–10, 12–13 (citing Ex. 1003 ¶¶ 118–122, 185–187; Ex. 1007, 76–77; Ex. 1043 ¶¶ 29, 48, 50–53; Ex. 2078, 203:24–204:9). Petitioner asserts that

because Goossens2003 discloses providing communication-management functionality in a network interface of the NoC, Goossens2003 teaches toward what Patent Owner “contends is the claimed configuration.” *Id.* at 10–11 (citing Ex. 1043 ¶¶ 48, 53, 58–60).

As for Drake’s alleged teaching away, Petitioner asserts that the “mere fact that Drake’s off-chip LAN embodiment shows QoS interfacing components” located in source station 10 does not teach away from implementing those components outside of the IPs in “the network-on-chip environment.” Reply 11 (emphasis omitted) (citing Ex. 1043 ¶¶ 26–29, 55).

(ii) Reasonable Expectation of Success

Regarding Patent Owner’s assertion that an ordinarily skilled artisan “under Petitioner’s definition” would not have had a reasonable expectation of success, Petitioner contends that the proposed combination “would have been easily within the skill of” that artisan. Reply 12–13 (citing Ex. 1003 ¶¶ 80–82, 164–166; Ex. 1043 ¶¶ 33–39).

Additionally, Petitioner contends that the disclosure in Drake cited by Patent Owner to support the assertion about complexity implementing Drake’s QoS requestor manager 12 in Goossens2003’s NoC “does not show that the combination would have been expected to be ‘complex.’” Reply 11 (citing Ex. 1006, 2:57–3:3; Resp. 52–54). Petitioner contends that the disclosure in Drake cited by Patent Owner “merely suggests that Drake reduces complexity because its QoS management is ‘almost entirely concentrated in a single QoS management station on the LAN.’” *Id.* (quoting Ex. 1006, 2:77–3:1). According to Petitioner, the “single QoS management station on the LAN” corresponds to the station comprising QoS allocator 20 (mapped to the claimed “resource manager”). *Id.*

(d) Patent Owner's Contentions in the Sur-reply

(i) Motivation to Combine

Patent Owner contends that the Reply includes improper new network-interface theories of unpatentability as follows:

- (1) Drake's QoS requestor manager 12 is a network-interface component;
- (2) an ordinarily skilled artisan would have implemented Drake's QoS requestor manager 12 in a network interface in Goossens2003's NoC; and
- (3) a skilled artisan would have been motivated to do so based on an alleged "need for interfacing components" in both off-chip and on-chip networks.

Sur-reply 5–6 (citing Reply 9–15); *see id.* at 16.

Patent Owner contends that these network-interface theories are "improper because the Petition never mentions 'interface' in relation to Drake, much less Drake's QoS-12." Sur-reply 5. Patent Owner also contends that the Petition relies on Goossens2003's network interface and Drake's QoS requestor manager 12 "as alternatives, not in combination." *Id.* at 5 n.4 (citing Pet. 62–63, 65–66; Reply 9 n.4, 16).

Patent Owner asserts that Dr. Mowry testified at his second deposition that Drake's QoS requestor manager 12 could have been implemented anywhere on the chip in Goossens2003 and that a network interface "is only 'a' natural place and not the place" QoS requestor manager 12 would have been implemented. Sur-reply 7 (emphasis omitted) (citing Ex. 2088, 81:1–82:10, 89:6–20, 93:5–103:8, 114:3–116:8). Patent Owner asserts that Dr. Mowry's testimony that Drake's QoS requestor manager 12 could have been implemented anywhere on the chip in Goossens2003 "undermines the alleged motivation of interfacing" because QoS requestor manager 12 "is not

needed” in Goossens2003’s network interface. *Id.* According to Patent Owner, the “possibility” that QoS requestor manager 12 could have been implemented in Goossens2003’s network interface is “insufficient for motivation.” *Id.* (citing *Virtek Vision Int’l ULC v. Assembly Guidance Sys., Inc.*, 97 F.4th 882, 886–87 (Fed. Cir. 2024)).

Patent Owner also asserts that Dr. Mowry’s testimony that Drake’s QoS requestor manager 12 could have been implemented anywhere on the chip in Goossens2003 “creates the same redundancy issue discussed” in the Response, i.e., that Goossens2003’s IPs would communicate directly with the claimed “resource manager” and not use QoS requestor manager 12 (mapped to the claimed “communication manager”) as an intermediary. Sur-reply 7–8 (citing Resp. 26–28, 34–37, 49–50, 56–60).

Patent Owner additionally asserts that Drake’s QoS requestor manager 12 is only a QoS component and not also a network-interface component. Sur-reply 8 (citing Ex. 1006, 4:32–37, 5:5–8, Fig. 1; Ex. 1043 ¶¶ 23, 52; Ex. 2088, 42:11–43:9). Patent Owner explains that QoS requestor manager 12 is not a network-interface component because it “assembles/formats the QoS request, and this is not network interfacing” since the QoS request “only needs to be understood by QoS allocator 20,” not by the network. *Id.* (emphasis omitted) (citing Ex. 1006, 4:32–5:8; Ex. 1043 ¶¶ 52, 114; Ex. 2088, 51:8–52:16, 60:12–61:22).

Patent Owner contends that transport protocol stack 15 and MAC entity 16 in Drake’s source station 10 format a request packet and launch the request packet on LAN 17. Sur-reply 8–9 (emphasis omitted) (citing Ex. 1006, 4:30–32, 4:37–40). Patent Owner also contends that transport protocol stack 15 and MAC entity 16 are “standard parts of all stations

attached to [the prior art] LAN.” *Id.* at 9 (alteration by Patent Owner) (quoting Ex. 1006, 4:41–42).

To support its contention concerning “standard parts of all stations,” Patent Owner provides a highlighted version of Drake’s Figure 1 as reproduced below (Sur-reply 10):

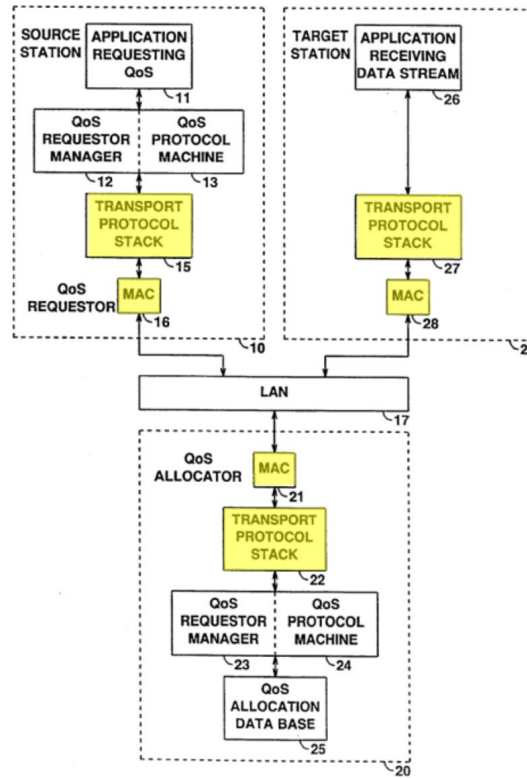


Figure 1 depicts a QoS management system. Ex. 1006, 3:36–40, Fig. 1. The above highlighted version of Figure 1 includes yellow highlighting over the following components:

- (1) transport protocol stack 15 and MAC entity 16 in source station 10;
- (2) MAC entity 21 and transport protocol stack 22 in QoS allocator 20; and
- (3) transport protocol stack 27 and MAC entity 28 in target station 29.

See Sur-reply 10.

Further, Patent Owner asserts that if source station 10 included any network-interface components, they would “only be” transport protocol stack 15 and MAC entity 16. Sur-reply 8 (citing Ex. 1006, 4:27–5:17; Ex. 2070 ¶¶ 221–223, 288–290).

Patent Owner contends that the “need for interfacing components in both off-chip and on-chip networks” identified by Petitioner lacks merit for four reasons. See Sur-reply 11–12. First, Patent Owner asserts that (a) Drake’s QoS requestor manager 12 assembles/formats a QoS request, not a request packet for transmission over a network, and (b) Goossens2003’s IPs already send “a completed QoS service request, so there is no need for [QoS requestor manager 12] to assemble/format the request.” *Id.* at 11.

Second, Patent Owner asserts that Drake’s QoS requestor manager 12 does not “translate” different protocols used by a network and instead assembles/formats a QoS request “to be understood by QoS allocator 20, not a request packet to be understood by LAN 17.” Sur-reply 11 (citing Ex. 1006, 4:32–5:8; Ex. 2088, 51:8–52:16, 60:12–61:22).

Third, Patent Owner asserts that Goossens2003 discloses interfacing functionality and implementing Drake’s QoS requestor manager 12 “to provide ‘interfacing’ would be unnecessary.” Sur-reply 11–12 (citing Ex. 1043 ¶¶ 52, 114; Ex. 2088, 96:17–97:10, 125:11–128:8, 132:13–134:2; Reply 9).

Fourth, Patent Owner asserts that an ordinarily skilled artisan would not have implemented Drake’s QoS requestor manager 12 in a network interface in Goossens2003’s NoC since (a) Drake’s off-chip network interface would include a “dedicated processor” and (b) including a “dedicated processor” in an on-chip network interface “is not feasible.”

Sur-reply 12 (quoting Ex. 1001, 2:21–22). Patent Owner explains that including a “dedicated processor” in an on-chip network interface “is not feasible” because the size of the network interface would become “comparable to or larger than the IP to be connected to the network.” *Id.* (quoting Ex. 1001, 2:21–24) (citing Ex. 2088, 34:8–37:2, 158:14–159:5).

Patent Owner contends that the Petition and the Reply fail to specify how Drake’s QoS requestor manager 12 and QoS allocator 20 “would work in” Goossens2003. Sur-reply 13. According to Patent Owner, Petitioner “simply cherry-picked two components of Drake and relied on a generic motivation to combine” based on Drake’s QoS management process “as a whole, without addressing the context of those two components in either reference.” *Id.* (citing Pet. 16–20, 51–54). Patent Owner contends that Petitioner’s “cherry-picking of Drake’s components, with no specific motivation, demonstrate[s] that Petitioner improperly relies on hindsight.” *Id.* Patent Owner also contends that “Petitioner’s hindsight is further demonstrated by Dr. Mowry relying on the ’449 patent itself for guidance and also reading Drake’s QoS-12’s function—assembling/formatting a request—into claim 2” that “does not recite that function” for the claimed “communication manager.” *Id.* at 14 (citing Ex. 2088, 19:22–20:8, 20:23–21:9, 137:8–139:4).

Regarding Petitioner’s contention that an ordinarily skilled artisan would have implemented Drake’s QoS functionality in Goossens2003 with Drake’s QoS requestor manager 12 “rather than modify Drake further,” Patent Owner argues that Petitioner “fails to articulate a reason to include” Drake’s QoS requestor manager 12 in Goossens2003 because the “mere existence” of a “possible” arrangement for QoS requestor manager 12 in

Goossens2003 is insufficient. Sur-reply 15 (emphasis omitted) (citing Reply 8).

Patent Owner faults Petitioner for failing to include Drake's QoS protocol machine 13 in the proposed combination because (1) QoS requestor manager 12 "cannot work without" QoS protocol machine 13 and (2) QoS protocol machine 13 performs an "important" function in Drake, i.e., "preregistration." Sur-reply 13, 15 (citing Ex. 1006, 4:32–37, 4:62–65, Fig. 1; Ex. 1037, 55:7–13; Ex. 2088, 51:8–54:13, 59:15–60:11, 70:4–21, 75:24–78:22, 68:22–69:24).

Patent Owner asserts that an ordinarily skilled artisan "would have been dissuaded from" implementing Drake's QoS components in Goossens2003's NoC because "it contradicts Drake's premise of implementing" QoS components outside of the network. Sur-reply 16.

Patent Owner asserts that the Reply includes an "improper new argument" that Drake's QoS allocator 20 would receive a service request from Goossens2003's IP through Drake's QoS requestor manager 12 based on Drake's data path. Sur-reply 17, 19 (citing Reply 14); *see id.* at 23. According to Patent Owner, this "improper new argument" rests on Petitioner's improper new network-interface theories of unpatentability. *Id.* at 18.

Patent Owner asserts that this "improper new argument" is "inapplicable" to the proposed combination because QoS requestor manager 12 and QoS allocator 20 are "arranged differently in Drake (inside LAN 17/network) versus Goossens200X (outside NOC/network)." Sur-reply 17–18 (emphasis omitted). Confusingly, however, Patent Owner also asserts that "Drake's QoS components are implemented differently in

Goossens200X (inside NOC/network) than in Drake (outside LAN/network).” *Id.* at 23 (emphasis omitted); *see id.* at 16 (“Drake’s premise of implementing QoS components outside an existing, prior-art network”).

Regarding Petitioner’s assertion that “Drake’s description of QoS allocator 20 communicating with ‘source station 10’ is not somehow motivation to change Drake’s data path,” Patent Owner contends that “there must be motivation to combine Drake’s data path” with Goossens2003 because the “mere existence” of a “possible” arrangement is insufficient. Sur-reply 19 (emphasis omitted) (citing Reply 15; *Virtek*, 97 F.4th at 886–89).

Additionally, Patent Owner contends that the Petition and the Reply fail to establish a “motivation specific” to claims 6 and 10 that yields the claimed inventions. Sur-reply 18 (citing Pet. 33–38, 55–60; Reply 15). According to Patent Owner, the Reply “merely references” the motivation-to-combine arguments for claims 1 and 2, and claims 1 and 2 “do not include the limitations of claims 6 and 10.” *Id.*

(ii) Reasonable Expectation of Success

Patent Owner asserts that an ordinarily skilled artisan “under Petitioner’s definition” would not have had a reasonable expectation of success in combining Drake’s QoS teachings with Goossens2003’s teachings because that person would have lacked both system-on-chip experience and network-on-chip experience. Sur-reply 20.

(e) Analysis

For the reasons explained below, an ordinarily skilled artisan would have been motivated to combine Drake’s QoS teachings with

Goossens2003's teachings in the way Petitioner proposes and would have had a reasonable expectation of success. *See* Pet. 51–54, 57–58, 62–63; Reply 6–7, 11–14; Ex. 1003 ¶¶ 156–166, 173, 175, 183, 187; Ex. 1043 ¶¶ 18–20, 23, 29, 33–39, 44–46, 50, 55; Ex. 2078, 203:24–204:8, 212:16–213:10; Ex. 2088, 36:14–15, 95:14–96:1.

(i) Motivation to Combine

a. Reason to Combine the Teachings of the References

Petitioner identifies a reason that would have prompted an ordinarily skilled artisan to combine Drake's QoS teachings with Goossens2003's teachings in the way Petitioner proposes. *See* Pet. 51–53, 57–58, 63; Reply 6–7, 14; Ex. 1003 ¶¶ 156–166, 175, 187; Ex. 1043 ¶¶ 44–46. In particular, as Petitioner contends, an ordinarily skilled artisan would have been motivated to combine Drake's QoS teachings with Goossens2003's teachings to:

- (1) “obtain the benefits of Drake's known solution to ensuring the availability of network resources for guaranteed services” using QoS requestor manager 12 (mapped to the claimed “communication manager”) and QoS allocator 20 (mapped to the claimed “resource manager”); and
- (2) “create an SoC with improved performance and efficiency,” e.g., by “ensuring that connections established by IPs are able to provide the required services.”

See Pet. 51–53, 57–58, 63; Reply 6–7, 14; Ex. 1003 ¶¶ 156–166, 175, 187; Ex. 1043 ¶¶ 44–46, 50.

As Petitioner contends, Goossens2003 explains that implementing connections in an NoC requires “resource management” but “does not describe a specific component or mechanism” in the NoC for (1) “tracking

resource usage,” (2) “managing resource usage,” or (3) “determining the availability of the resources required for a requested connection.” *See* Pet. 51, 57; Reply 6; Ex. 1003 ¶¶ 159, 173; Ex. 1007, 65, 68–69, 74; Ex. 1043 ¶¶ 23, 29. Hence, an ordinarily skilled artisan “would have looked to Drake’s disclosures” for “details regarding the implementation of resource management” in Goossens2003’s NoC. *See* Ex. 1003 ¶¶ 156, 160–164, 173, 183; Ex. 1043 ¶¶ 44–45, 48.

“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)). Here, Petitioner identifies Drake’s known technique for QoS management used to improve network performance by “ensuring the availability of network resources for guaranteed services” that would improve network performance in Goossens2003’s NoC in the same way when used according to Drake’s QoS teachings. *See* Pet. 51–53; Reply 6, 14; Ex. 1003 ¶¶ 156, 163–164; Ex. 1006, 1:8–11, 2:26–41, code (57); Ex. 1043 ¶¶ 44–46, 50.

b. Relevance of Off-Chip Networks to On-Chip Networks

We disagree with Patent Owner that “off-chip network designs [are] inapplicable to on-chip networks.” *See* Resp. 7, 54–55. 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) in the book titled “Domain-Specific Processors: Systems, Architectures, Modeling, and Simulation” edited by Shuvra S. Bhattacharyya et al. (2003) 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 (emphases added) (citations omitted); *see id.* at 174–99 (Exhibit H: Andrei Rădulescu & Kees Goossens, “Communication Services for Networks on Chip,” in the book titled “Domain-Specific Processors: Systems, Architectures, Modeling, and Simulation” edited by Shuvra S. Bhattacharyya et al. (2003)).

Consistent with the '449 patent, 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, 166 (citing Ex. 1010,²⁵ 277; Ex. 1013,²⁶ vii–viii; Ex. 1014,²⁷ 86–95; Ex. 1015,²⁸ 749–828); *see* Ex. 1043 ¶¶ 17–18. As support, Dr. Mowry quotes the following statements from chapters 2 and 5 in 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.”

²⁵ 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 177 of Exhibit 2029 (corresponding to page 277 of the book titled “Domain-Specific Processors: Systems, Architectures, Modeling, and Simulation” edited by Shuvra S. Bhattacharyya et al. (2003)).

²⁶ 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.

²⁷ Exhibit 1014 includes only pages i–viii and 1–59.

²⁸ 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.

Ex. 1003 ¶ 82 (quoting Ex. 1014,²⁹ 33 (chapter 2), 102 (chapter 5); *see* Ex. 1035, 121.

Additionally, Goossens2003 explains that a protocol stack may decouple “applications and architectures” and has been “used successfully in computer networks,” i.e., off-chip networks. Ex. 1007, 66. Goossens2003 also explains that network interfaces “bridge the network layer and transport layer” in the protocol stack. *Id.* at 74. Consistent with Goossens2003, Dr. Mowry explains that network interfaces in both off-chip networks and on-chip networks were (1) “known to perform the same general function” and (2) understood to decouple “computation from communication” by “enabling their host/IP module to communicate without requiring specific knowledge of the low-level network details.” Ex. 1043 ¶¶ 26, 51, 113. We credit Dr. Mowry’s testimony.

Hence, an ordinarily skilled artisan would not have rejected teachings concerning off-chip networks as irrelevant to on-chip networks. *See* Ex. 1001, 1:56–2:5; Ex. 1003 ¶¶ 33, 82, 166; Ex. 1013, vii–viii; Ex. 1014, 33; Ex. 1043 ¶¶ 17–18, 20, 38; Ex. 2029, 177. 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, 166; *see* Ex. 1043 ¶¶ 17–18, 20, 26. Also, an ordinarily skilled artisan would have understood that “off-chip resource allocation solutions were applicable to on-chip networks.” Ex. 1043 ¶ 38.

²⁹ Exhibit 1014 includes only pages i–viii and 1–59.

Accordingly, “the teachings of Drake apply directly to systems on chip.” Ex. 2088, 36:14–15; *see* Ex. 1043 ¶¶ 18, 20, 38. Patent Owner’s contentions to the contrary lack merit. *See* Resp. 6–8, 51, 54–55.

c. Petitioner’s Explanations in the Reply

The challenged claims do not specify a location for the claimed “communication manager” or the claimed “resource manager” other than “disposed on a chip.” Ex. 1001, 18:32–19:5, 19:17–20:26. Patent Owner concedes that the challenged claims do not specify a location for those claimed components. Tr. 32:15–16. So the Petition did not need to specify a location in the proposed combination for Drake’s QoS requestor manager 12 (mapped to the claimed “communication manager”) or Drake’s QoS allocator 20 (mapped to the claimed “resource manager”) to show that the proposed combination would have yielded the claimed inventions.

After Patent Owner argued in the Response that the Petition lacked implementation details for the proposed combination, Petitioner explained in the Reply that an ordinarily skilled artisan would have implemented Drake’s QoS management process in Goossens2003 as follows:

- (1) Drake’s QoS requestor manager 12 (mapped to the claimed “communication manager”) in a network interface in Goossens2003’s NoC because a skilled artisan would have known that in Goossens2003’s on-chip context the “equivalent place for QoS interfacing components” like Drake’s QoS requestor manager 12 is outside of the IPs, e.g., in a network interface of the NoC; and
- (2) Drake’s QoS allocator 20 (mapped to the claimed “resource manager”) as “a centralized unit anywhere on the chip connected to the network” in Goossens2003’s SoC such that QoS allocator 20 would receive service requests from “Goossens2003’s IP module (the unit

making the request) through Drake's QoS requestor manager 12 (data path shown in Drake)."

Reply 11–12, 14 (citing Ex. 1003 ¶ 173; Ex. 1037, 80:25–81:3, 95:13–22, 103:6–11, 103:24–104:14; Ex. 1043 ¶¶ 43–45, 55, 61–62, 117; Ex. 2078, 212:20–213:3); *see* Pet. 58 (explaining that an ordinarily skilled artisan would have implemented Drake's QoS allocator 20 as "a circuit on the same integrated circuit chip" as Goossens2003's IPs and NoC); Ex. 1003 ¶ 173.

For the reasons stated in the Order denying Patent Owner's motion to strike and the Decision denying Patent Owner's request for rehearing, Petitioner's explanations in the Reply properly respond to Patent Owner's arguments in the Response and do not constitute improper new network-interface theories of unpatentability. *See* Paper 64, 23–26; Paper 68, 16–20; 37 C.F.R. § 42.23(b).

Also, we disagree with Patent Owner that the Reply includes an "improper new argument" that Drake's QoS allocator 20 would receive a service request from Goossens2003's IP through Drake's QoS requestor manager 12 based on Drake's data path. *See* Sur-reply 17, 19 (citing Reply 14). In the Response, Patent Owner contended that the Petition fails to explain where Drake's QoS allocator 20 would "purportedly receive requests from in the alleged combination with Goossens2003," e.g., from the IPs or from "somewhere else." *See* Resp. 54 (citing Pet. 61–62). In the Reply, Petitioner explained that the proposed combination "itself shows where" Drake's QoS allocator 20 would receive service requests from, i.e., from "Goossens2003's IP module (the unit making the request) through Drake's QoS requestor manager 12 (data path shown in Drake)." Reply 14 (citing Pet. 61–62; Ex. 1043 ¶¶ 43–45).

Petitioner’s explanation in the Reply properly responds to Patent Owner’s contention in the Response about alleged inadequacies in the Petition concerning implementation details for the proposed combination. *See* Resp. 54; Reply 14; *Rembrandt Diagnostics, LP v. Alere, Inc.*, 76 F.4th 1376, 1384–85 (Fed. Cir. 2023) (determining that motivation-to-combine arguments in a petitioner reply properly addressed arguments in a patent owner response); *Apple Inc. v. Andrea Elecs. Corp.*, 949 F.3d 697, 706–07 (Fed. Cir. 2020) (“*Andrea Elecs.*”) (determining that unpatentability arguments in a petitioner reply properly addressed arguments in a patent owner response); 37 C.F.R. § 42.23(b).

d. Implementing Drake’s QoS Requestor Manager 12

Regarding Drake’s QoS requestor manager 12 (mapped to the claimed “communication manager”), we agree with Petitioner that an ordinarily skilled artisan would have implemented QoS requestor manager 12 in a network interface in Goossens2003’s NoC, i.e., outside of the IPs. *See* Reply 12; Ex. 1003 ¶¶ 185–186; Ex. 1007, 74, 76–77; Ex. 1043 ¶¶ 19, 29, 38, 48, 55, 61, 76, 156; Ex. 2078, 203:24–204:8; Ex. 2088, 95:14–96:1. Goossens2003 discloses providing communication-management functionality in a network interface of the NoC, i.e., outside of the IPs. *See* Ex. 1003 ¶¶ 185–186; Ex. 1007, 74, 76–77; Ex. 1043 ¶¶ 19, 29, 76; Ex. 2088, 95:14–21. Specifically, Goossens2003 explains that:

- (1) the NoC contains “two components: routers and network interfaces”;
- (2) routers transport data at the network layer;
- (3) services are offered to IPs at “the transport layer and are end to end (master to slave and vice versa)”;

- (4) network interfaces “bridge the network layer and transport layer” and convert “network layer services of the routers to transport layer services for the user”;
- (5) IPs “negotiate with network interfaces to obtain connections with certain properties,” including “reordering, transaction completion, and flow control”; and
- (6) “network interfaces may reserve resources.”

Ex. 1007, 71, 74, 76–77; *see* Ex. 1003 ¶¶ 185, 193, 199.

An ordinarily skilled artisan would have understood that the network interfaces in an on-chip network “paralleled the network interfaces of a traditional off-chip network” and that network-interface components in an on-chip network would reside outside of the IP modules, “just as Goossens2003 itself teaches.” Ex. 1043 ¶¶ 26–27.

For instance, Goossens2003’s Figure 4.5 (reproduced below with yellow highlighting) shows network interfaces residing outside of the IP modules:

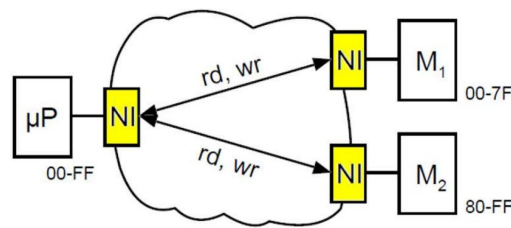


Figure 4.5. A narrowcast connection.

Figure 4.5 illustrates an example narrowcast connection between a master IP module identified as “μP” (microprocessor) and two slave IP modules identified as “M₁” (memory module 1) and “M₂” (memory module 2) together with a network interface (NI) associated with each of the three processing modules. Ex. 1007, 72; *see* Ex. 1003 ¶ 170. The above

highlighted version of Figure 4.5 includes yellow highlighting over each of the three network interfaces. *See* Ex. 1003 ¶ 200.

Additionally, an ordinarily skilled artisan would have understood that Drake's QoS requestor manager 12 functions as a network-interface component as well as a QoS component. *See* Ex. 1043 ¶¶ 15, 23, 28, 52–53, 55, 66, 114–115, 127, 131. An ordinarily skilled artisan would have understood that QoS requestor manager 12 functions as a network-interface component because:

- (1) “network interfaces were commonly included as part of a host in an off-chip LAN system”;
- (2) QoS requestor manager 12 assembles a QoS request for communication through LAN 17;
- (3) QoS protocol machine 13, transport protocol stack 15, and MAC entity 16 in source station 10 are also network-interface-type components involved in enabling communication through LAN 17; and
- (4) QoS requestor manager 12, QoS protocol machine 13, transport protocol stack 15, and MAC entity 16 reside at “the location of a network interface” in source station 10, i.e., between application 11 and LAN 17.

Id. ¶ 28; *see id.* ¶¶ 15, 27; Ex. 1006, 4:18–40, 4:58–65, Fig. 1.

Patent Owner's assertion that Drake's QoS requestor manager 12 is not a network-interface component because it “assembles/formats the QoS request, and this is not network interfacing,” does not accurately reflect how the components in source station 10 operate. *See* Sur-reply 8. In source station 10, QoS requestor manager 12 receives an internal message from application 11 and “utilizes QoS protocol machine 13 to format the QoS request.” Ex. 1006, 4:62–65; *see id.* at 4:34–37; Ex. 1003 ¶ 131. Then,

transport protocol stack 15 formats a request packet, and MAC entity 16 launches the request packet on LAN 17. Ex. 1006, 4:37–40.

Collectively, QoS requestor manager 12, QoS protocol machine 13, transport protocol stack 15, and MAC entity 16 provide an interface between application 11 and LAN 17 that permits information in an internal message from application 11 to traverse LAN 17 and reach a destination, e.g., QoS allocator 20. *See* Ex. 1006, 4:30–40, 4:62–67, Fig. 1; Ex. 1043 ¶¶ 15, 27–28, 85; Ex. 2078, 174:10–19. Hence, we disagree with Patent Owner that Drake’s QoS requestor manager 12 is only a QoS component and not also a network-interface component. *See* Sur-reply 8.

Because (1) an ordinarily skilled artisan would have understood that Drake’s QoS requestor manager 12 functions as a network-interface component as well as a QoS component and (2) Goossens2003 discloses providing communication-management functionality in a network interface of the NoC, a skilled artisan would have implemented Drake’s QoS requestor manager 12 in a network interface in Goossens2003’s NoC, i.e., outside of the IPs. *See* Ex. 1003 ¶¶ 185–186; Ex. 1007, 74, 76–77; Ex. 1043 ¶¶ 15, 19, 23, 28–29, 38, 48, 52–53, 55, 61, 66, 76, 114–115, 127, 131, 156; Ex. 2078, 203:24–204:8; Ex. 2088, 95:14–96:1. Consistent with this, the ’449 patent explains that the “communication manager” may reside in “one or some of the network interfaces.” Ex. 1001, 10:3–6. Moreover, Patent Owner admits that the ’449 patent describes “the ‘communication manager’ as being arranged in a ‘network,’ a ‘router network,’ or a ‘network interface means.’” Ex. 1020, 19; *see* Resp. 14 (citing Ex. 1001, 10:3–6).

Patent Owner’s assertion that an ordinarily skilled artisan would not have implemented Drake’s QoS requestor manager 12 in a network interface

in Goossens2003's NoC since (a) Drake's off-chip network interface would include a "dedicated processor" and (b) including a "dedicated processor" in an on-chip network interface "is not feasible" rests on the erroneous premise that Drake's off-chip network interface would include a "dedicated processor." *See* Sur-reply 12. Drake does not disclose that source station 10 includes a network interface with a "dedicated processor." *See, e.g.,* Ex. 1006, 4:18–65, Fig. 1. Further, the interfacing components in source station 10 would not require a "dedicated processor" if they were implemented with fixed-function hardware, e.g., an application specific integrated circuit (ASIC). Ex. 2088, 34:12–35:24, 36:16–37:2. Moreover, an ordinarily skilled artisan would have recognized that component size "could have been predictably reduced" by implementing fixed-function hardware instead of using a general-purpose processor. Ex. 1043 ¶ 41.

e. Implementing Drake's QoS Allocator 20

Regarding Drake's QoS allocator 20 (mapped to the claimed "resource manager"), we agree with Petitioner that an ordinarily skilled artisan would have implemented QoS allocator 20 as "a centralized unit anywhere on the chip connected to the network" in Goossens2003's SoC. *See* Reply 11–12; Ex. 1003 ¶ 173; Ex. 1043 ¶¶ 38, 45, 55; Ex. 2078, 212:16–213:10. Drake explains that "the quality of service management of a local area network is almost entirely concentrated in a single QoS management station," i.e., the station comprising QoS allocator 20, "attached to the network" or "on the LAN." Ex. 1006, 2:66–3:1, 4:66–67, code (57), Fig. 1; *see* Ex. 1043 ¶ 55. Hence, an ordinarily skilled artisan would have recognized that QoS allocator 20 "could be implemented as single piece of centralized hardware on the NOC in Goossens2003 (just like

in Drake QoS allocator 20 is shown as a single piece of centralized hardware ‘on the LAN’ – meaning connected to the LAN).” Ex. 1043 ¶ 55; *see* Ex. 2078, 212:16–213:10.

f. Alleged Inconsistent Implementations

Patent Owner’s assertion that QoS requestor manager 12 and QoS allocator 20 are “implemented differently” in Drake (outside of the network) than in Goossens2003 (inside of the network) lacks merit. *See* Sur-reply 16, 23. Goossens2003’s network interfaces reside at the network’s boundary, not inside of the network. *See* Ex. 1007, 72 (Fig. 4.5). Drake’s QoS requestor manager 12 resides at “the location of a network interface” in source station 10, i.e., between application 11 and LAN 17. Ex. 1043 ¶ 28; *see id.* ¶¶ 15, 27; Ex. 1006, 4:27–40, 4:58–65, Fig. 1. Hence, Drake’s QoS requestor manager 12 resides at the network’s boundary together with the other network-interface-type components in source station 10. *See* Ex. 1043 ¶¶ 15, 28; Ex. 2078, 174:10–19. Consistent with the references, and for the reasons discussed above, an ordinarily skilled artisan would have implemented Drake’s QoS requestor manager 12 in a network interface in Goossens2003’s NoC, i.e., outside of the IPs at the network’s boundary. *See* Ex. 1003 ¶¶ 185–186; Ex. 1007, 74, 76–77; Ex. 1043 ¶¶ 19, 29, 38, 48, 55, 61, 76, 156; Ex. 2078, 203:24–204:8; Ex. 2088, 95:14–96:1; *supra* § III.E.3(e)(i).d.

As for Drake’s QoS allocator 20, Drake describes it as “attached to the network” or “on the LAN.” Ex. 1006, 2:66–3:1, 4:66–67, code (57), Fig. 1; *see* Ex. 1043 ¶ 55. Consistent with the references, and for the reasons discussed above, an ordinarily skilled artisan would have implemented Drake’s QoS allocator 20 as “a centralized unit anywhere on

the chip connected to the network” in Goossens2003’s SoC. *See* Ex. 1003 ¶ 173; Ex. 1043 ¶¶ 38, 45, 55; Ex. 2078, 212:16–213:10; *supra* § III.E.3(e)(i).e.

g. Alleged Redundancy

As for Patent Owner’s argument that including Drake’s QoS requestor manager 12 in Goossens2003 would have been “redundant” since Goossens2003’s IPs “already generate a connection request and send it to the alleged ‘resource manager’ without Drake’s QoS requestor manager,” we disagree. *See* Resp. 49–50, 56, 59–60; Sur-reply 7–8, 11–12. Drake’s QoS requestor manager 12 does not just generate and send a connection request, i.e., a QoS request (also called a QoS allocation request). *See* Ex. 1003 ¶¶ 67, 120, 133, 197; Ex. 1006, 8:20–9:51; Ex. 1043 ¶¶ 89, 93. QoS requestor manager 12 also generates and sends a QoS allocation change request and a QoS de-allocation announcement. Ex. 1006, 8:20–29, 8:65–66, 9:2–3, 11:52–56, 12:39–42, 13:13–15, Figs. 6–8; *see id.* at 3:53–56; Ex. 1003 ¶ 120.

Additionally, QoS requestor manager 12 receives a QoS allocation reply (an allocation acceptance message or an allocation denial message) and a QoS change reply (a change acceptance message or a change denial message). Ex. 1006, 8:20–29, 8:50, 9:12, 11:22–26, 11:30–33, 11:36–38, 12:48–52, 12:64–67, 13:2–7, 13:28–33, Figs. 5, 7–8; *see id.* at 3:49–52, 3:57–65, 4:55–57; Ex. 1003 ¶¶ 133, 197; Ex. 1043 ¶¶ 89, 93.

Although Drake describes source station 10 as sending and receiving these QoS messages, an ordinarily skilled artisan would have recognized that QoS requestor manager 12 also does so when interacting with application 11 to communicate information in both directions. *See* Ex. 1006, 3:21–28,

3:49–65, 4:62–65, 8:20–29, 11:22–26, 11:30–33, 11:36–38, 11:52–56, 12:39–42, 12:48–52, 12:64–67, 13:2–7, 13:13–15, 13:28–33; Ex. 1043 ¶¶ 15, 83–86, 90–93. For instance, Drake states that “application 11 may simply be a file server application” that “causes multimedia data to be transported from a multimedia data base to LAN 17.” Ex. 1006, 4:58–60; *see id.* at 10:11–15. In that context, a service request “comes from the server” corresponding to source station 10, but the service request “actually originates” from application 11 “running on the server.” Ex. 1043 ¶ 15.

After the service request originates from application 11, QoS requestor manager 12 sends (forwards) the service request to QoS allocator 20. Ex. 1043 ¶¶ 83, 85–86; *see* Ex. 1003 ¶¶ 130–131; Ex. 1006, 4:30–40, 4:62–65. For example, when application 11 wants to transport multimedia data to application 26 in target station 29, QoS requestor manager 12 “realizes that it must first send a message somewhere else,” i.e., to QoS allocator 20. Ex. 1043 ¶ 86. After receiving a message from QoS requestor manager 12, QoS allocator 20 responds by sending a reply message to QoS requestor manager 12 that contains information for application 11. *Id.* ¶¶ 90, 92–93.

An ordinarily skilled artisan would have understood that “the only way Drake’s QoS [system] works is for the reply regarding the QoS request to get back to application 11,” i.e., the entity that (1) “originally made the QoS request” and (2) subsequently “sends a multimedia file over the established link.” Ex. 1043 ¶¶ 90, 93; *see* Ex. 1006, 4:30–32, 4:58–60. Also, an ordinarily skilled artisan would have understood that QoS requestor manager 12 “interfaces” with application 11 for “messages going in both

directions.” Ex. 1043 ¶ 92; *see id.* ¶ 90; Ex. 1006, 3:21–28, 4:62–64, 8:20–29.

Thus, Drake discloses QoS requestor manager 12 sending and receiving several QoS messages used for QoS management that Goossens2003 does not disclose, such as QoS messages with “allocation confirmations, de-allocation requests, allocation change requests and allocation change confirmations.” *See* Ex. 1003 ¶ 120; Ex. 1006, 3:21–28, 8:20–29, 8:65–9:3, 11:49–12:34. Due to that additional functionality, including Drake’s QoS requestor manager 12 in Goossens2003 would not have been “redundant,” contrary to Patent Owner’s assertion. *See* Resp. 49–50, 56; Sur-reply 7–8, 11–12.

Further, even if Drake’s QoS requestor manager 12 lacked that additional functionality, we agree with Petitioner that an ordinarily skilled artisan would have implemented Drake’s QoS functionality in Goossens2003 using Drake’s QoS requestor manager 12 “rather than modify Drake further.” *See* Reply 8; Ex. 1043 ¶¶ 50–52, 66. As Dr. Mowry explains, QoS requestor manager 12 is an “important aspect” of Drake’s QoS management system. Ex. 1043 ¶ 50. In particular, QoS requestor manager 12 acts as an interface (e.g., by appropriately formatting a service request) between the requesting module and QoS allocator 20 that manages requests for the entire network. *Id.* ¶ 67; *see* Ex. 1006, 4:30–37, 4:62–67. In its role as an interface, QoS requestor manager 12 “raise[s] the level of abstraction for requests so that the requesting module [does] not need to be redesigned for different implementations.” Ex. 1043 ¶ 67. Hence, an ordinarily skilled artisan “would not have simply removed it in the combination.” *Id.* ¶ 50.

As Dr. Mowry explains, the “predictable, beneficial combination” of Drake’s QoS teachings with Goossens2003’s teachings “would be to simply use Drake’s QoS components communicating with each other as Drake taught,” including QoS requestor manager 12 and QoS allocator 20 communicating with each other, “without further alteration.” Ex. 1043 ¶¶ 52, 66. We credit Dr. Mowry’s testimony.

h. Alleged Teaching Away

Patent Owner’s assertion that Goossens2003 “teaches away” from the proposed combination rests on the erroneous premise that Drake’s QoS requestor manager 12 would reside in Goossens2003’s IP in the proposed combination. *See* Resp. 51–52. For the reasons discussed above, an ordinarily skilled artisan would have implemented Drake’s QoS requestor manager 12 in a network interface in Goossens2003’s NoC, i.e., outside of the IPs at the network’s boundary. *See* Ex. 1003 ¶¶ 185–186; Ex. 1007, 74, 76–77; Ex. 1043 ¶¶ 19, 29, 38, 48, 55, 61, 76, 156; Ex. 2078, 203:24–204:8; Ex. 2088, 95:14–96:1; *supra* §§ III.E.3(e)(i).d, III.E.3(e)(i).f.

Patent Owner’s assertion that Drake “teaches away” from including QoS requestor manager 12 in a network because QoS requestor manager 12 “is purposefully within source station 10 rather than within the LAN” rests on an erroneous analysis of source station 10. *See* Resp. 52; Sur-reply 16. As Dr. Mowry explains, in both on-chip networks and off-chip networks, a network interface is “functionally disposed in the same location,” i.e., between “the computing component” (Drake’s application 11/ Goossens2003’s IP) and “the rest of the network.” Ex. 1043 ¶ 27 (emphasis omitted); *see id.* ¶ 15. As Dr. Mowry also explains, an ordinarily skilled artisan “would have understood Drake to teach that the QoS requestor

manager 12 is part of the network interface components for source station 10.” *Id.* ¶ 28; *see id.* ¶ 15; Ex. 1006, 4:27–40, 4:58–65, Fig. 1. We credit Dr. Mowry’s testimony.

Further, a “reference does not teach away” if “it merely expresses a general preference for an alternative invention but does not ‘criticize, discredit, or otherwise discourage’ investigation into the invention claimed.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009) (quoting *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004)). Patent Owner does not identify any statement in Goossens2003 or Drake that “criticize[s], discredit[s], or otherwise discourage[s]” the proposed combination that yields the claimed inventions. *See, e.g.*, Resp. 46–60; Sur-reply 13–20.

i. Alleged Reliance on Hindsight

As for Patent Owner’s contention that “Petitioner improperly relies on hindsight,” we disagree. *See* Sur-reply 13. An explicit analysis “whether there was an apparent reason to combine” the teachings of the references reduces “the risk of . . . falling prey to hindsight bias.” *See KSR Int’l*, 550 U.S. at 418, 421. As discussed above, Petitioner provides an explicit analysis why an ordinarily skilled artisan would have been motivated to combine Drake’s QoS teachings with Goossens2003’s teachings in the way Petitioner proposes, i.e., to (1) “obtain the benefits of Drake’s known solution to ensuring the availability of network resources for guaranteed services” using QoS requestor manager 12 and QoS allocator 20 and (2) “create an SoC with improved performance and efficiency,” e.g., by “ensuring that connections established by IPs are able to provide the

required services.” *See* Pet. 51–53, 57–58, 63; Reply 6–7, 14; Ex. 1003 ¶¶ 156–166, 175, 187; Ex. 1043 ¶¶ 44–46, 50; *supra* § III.E.3(e)(i).a.

j. Drake’s Data Path

As for Patent Owner’s contention that “there must be motivation to combine Drake’s data path” with Goossens2003 because the “mere existence” of a “possible” arrangement is insufficient, an ordinarily skilled artisan would have been motivated to combine Drake’s QoS teachings with Goossens2003’s teachings for the reasons discussed above. *See* Ex. 1003 ¶¶ 156–166, 175, 187; Ex. 1043 ¶¶ 44–46, 50; Sur-reply 19; *supra* §§ III.E.3(e)(i).a, III.E.3(e)(i).i. Regarding Drake’s “data path” specifically, the “predictable, beneficial combination” of Drake’s QoS teachings with Goossens2003’s teachings “would be to simply use Drake’s QoS components communicating with each other as Drake taught,” including QoS requestor manager 12 and QoS allocator 20 communicating with each other, “without further alteration.” Ex. 1043 ¶¶ 52, 66.

Insofar as Patent Owner references other aspects of Drake’s “data path,” “combining the *teachings* of references does not involve an ability to combine their specific structures.” *See In re Nievelt*, 482 F.2d 965, 968 (CCPA 1973) (emphasis by the court); Sur-reply 19.

k. Drake’s QoS Protocol Machine 13

As Patent Owner notes, the proposed combination does not expressly include Drake’s QoS protocol machine 13. *See* Sur-reply 13, 15. But that does not undermine Petitioner’s position. QoS protocol machine 13 does not correspond to a claimed component. *See* Ex. 1001, 18:32–19:5, 19:17–20:26; Ex. 1006, 4:32–37, 4:62–65. Thus, the proposed combination does not need QoS protocol machine 13 to yield the claimed inventions. *See*

Pet. 51–53, 57–58, 63; Reply 6–7, 11–12, 14; Ex. 1001, 18:32–19:5, 19:17–20:26.

Further, even if QoS requestor manager 12 requires QoS protocol machine 13, an obviousness analysis can “take account of the inferences and creative steps that a person of ordinary skill in the art would employ” because a skilled artisan 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). If QoS requestor manager 12 requires QoS protocol machine 13, a skilled artisan would have used them together when combining Drake’s QoS teachings with Goossens2003’s teachings.

1. Claims 6 and 10

Additionally, we disagree with Patent Owner that Petitioner fails to explain for claims 6 and 10 “why or how Goossens2003 would be modified or work with Drake’s teachings” to yield the claimed inventions. *See Resp.* 55, 60; Sur-reply 18.

In the Petition, the section addressing the motivation to combine Drake’s QoS teachings with Goossens2003’s teachings precedes the sections addressing how the combined disclosures in Goossens2003 and Drake teach each limitation in the challenged claims, including claims 6 and 10. Pet. 51–71; *see* Ex. 1003 ¶¶ 155–216. In the Petition, the section addressing the motivation to combine provides an explicit analysis why an ordinarily skilled artisan would have combined the teachings of the references in the way Petitioner proposes. Pet. 51–54; *see* Ex. 1003 ¶¶ 155–166. That section applies to all challenged claims, including claims 6 and 10. Pet. 51–71; *see* Ex. 1003 ¶¶ 155–216.

In the Reply, Petitioner provides additional details about why, where, and how an ordinarily skilled artisan would have implemented Drake's QoS management process in Goossens2003. Reply 6–7, 11–12, 14; *see* Ex. 1043 ¶¶ 44–46, 55, 61–62. Those additional details apply to all challenged claims, including claims 6 and 10. Reply 6–7, 11–12, 14; *see* Ex. 1043 ¶¶ 44–46, 55, 61–62.

(ii) Reasonable Expectation of Success

For the reasons explained below, we agree with Petitioner that an ordinarily skilled artisan would have had a reasonable expectation of success in combining Drake's QoS teachings with Goossens2003's teachings. *See* Pet. 52–54, 58, 62; Reply 11–13; Ex. 1003 ¶¶ 164–166, 173, 183, 187; Ex. 1043 ¶¶ 33–39, 55; Ex. 2078, 212:16–213:10.

As Petitioner explains, both Goossens2003 and Drake (1) address “the same field of data communication in packet-based networks” and (2) are “directed to ensuring that sufficient resources are available for the communication of multimedia content, such as audio and video.” *See* Pet. 53; Ex. 1003 ¶ 164; Ex. 1006, 1:22–23 (describing “audio and full motion video”), 4:58–60 (explaining that application 11 “causes multimedia data to be transported from a multimedia data base to LAN 17”); Ex. 1007, 62 (describing quality of service for “real-time applications . . . involving audio and video”). As Petitioner also explains, an ordinarily skilled artisan “would have reasonably expected that use of Drake's known solution to ensuring the availability of network resources for guaranteed services would improve” Goossens2003's NoC in the same way. *See* Pet. 53; Ex. 1003 ¶ 164.

Moreover, implementing “Drake’s QoS components and data path in Goossens2003” would have been “routine and straightforward.” Ex. 1043 ¶ 38; *see id.* ¶ 39. Obviousness “does not require absolute predictability of success.” *In re O’Farrell*, 853 F.2d 894, 903 (Fed. Cir. 1988).

The disclosure in Drake cited by Patent Owner to support the assertion about complexity implementing Drake’s QoS requestor manager 12 in Goossens2003’s NoC does not support that assertion. *See* Resp. 52 (citing Ex. 1006, 2:57–3:3; Ex. 2070 ¶ 264); Ex. 1006, 2:57–3:3. That disclosure states as follows:

A major advantage of the present invention is the ability to provide quality of service management in bridged LAN environments using all of the existing connection set-up procedures, thereby providing such QoS management with little added complexity. It is possible, of course, to create in the QoS management system a route selection mechanism if such a mechanism does not already exist in the LANs themselves.

In accordance with another feature of the present invention, the quality of service management of a local area network is almost entirely concentrated in a single QoS management station on the LAN, thereby significantly reducing the complexity of introducing QoS management into existing LAN networks.

Ex. 1006, 2:57–3:3.

The disclosure in Drake cited by Patent Owner to support the assertion about complexity implementing Drake’s QoS requestor manager 12 in Goossens2003’s NoC indicates that using a “single QoS management station on the LAN,” i.e., the station comprising QoS allocator 20, reduces “the complexity of introducing QoS management” into a network. *See* Ex. 1006, 2:65–3:3; Ex. 1043 ¶ 55.

Additionally, we disagree with Patent Owner that an ordinarily skilled artisan “under Petitioner’s definition” would have lacked both system-on-chip experience and network-on-chip experience. *See* Pet. 15; Sur-reply 20; Ex. 1003 ¶ 61. As discussed above, an ordinarily skilled artisan “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. 15; Ex. 1003 ¶ 61; *see supra* § III.B. This definition includes the word “or” when describing a skilled artisan’s experience. Pet. 15; Ex. 1003 ¶ 61; *see supra* § III.B. Contrary to Patent Owner’s suggestion, this definition contemplates that a skilled artisan may have system-on-chip experience (i.e., “experience with system-on-chip . . . technologies”) or network-on-chip experience (i.e., “experience with . . . networking technologies,” e.g., on-chip “networking technologies”). *See* Pet. 15; Ex. 1003 ¶ 61; Sur-reply 20.

4. 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. 54–61, 68–69; Reply 4, 16–17, 22–23. Specifically, Petitioner asserts that Goossens2003 discloses that:

- (1) a system on chip (SoC), i.e., an integrated circuit, includes multiple intellectual property blocks (IPs), i.e., multiple processing modules;
- (2) the SoC also includes a network on chip (NoC);
- (3) the NoC contains routers that transport data;
- (4) the NoC provides connections between IPs in the SoC, including connections between a master IP (first module) and one or more slave IPs (second modules);
- (5) each connection comprises a “request” channel and a “response” channel with “connection properties”;
- (6) “the request and response communications can be independently configured (e.g. for flow control, and throughput guarantees), allowing more fine-grained resource management”;
- (7) 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”; and
- (8) in a single transaction, (a) “the master sends a request,” (b) “a slave receives the request and executes it,” (c) “the slave sends the response,” and (d) “the master receives the response.”

Pet. 54–61, 68–69 (emphases omitted) (quoting Ex. 1007, 72–74); *see* Reply 4, 16.

Petitioner maps the claimed “first module” to a master IP module in Goossens2003's SoC. Pet. 59, 65; *see* Reply 4, 17; Paper 64, 16; Ex. 1003

¶¶ 176, 193–194; Ex. 1043 ¶¶ 13, 74; *infra* § III.E.4(g)(iii). Petitioner maps the claimed “second module” to a slave IP module in Goossens2003’s SoC. Pet. 59, 65; *see* Paper 64, 16; Ex. 1003 ¶¶ 176, 194; *infra* § III.E.4(g)(iii).

Additionally, Petitioner contends that Drake discloses “connections” between an application in a source station and a target station. Pet. 59. 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 60. According to Petitioner, the “throughput” and “end-to-end delay” (or latency) for each of Drake’s channels may be “adjusted independently,” and “[t]hese are the same channels and properties disclosed by Goossens2003.” *Id.* (citing Ex. 1003 ¶ 179).

(ii) Patent Owner’s Contentions

Patent Owner disputes that Drake discloses “independently configurable” communication channels according to claim 10’s preamble. *See* Resp. 23–24; Sur-reply 25–26. Specifically, Patent Owner asserts that Petitioner erroneously “assumes that Drake discloses multiple channels because data can be sent from the source station to the target station in both the ‘forward direction’ and the ‘backward direction.’” Resp. 23; *see* Sur-reply 25–26.

Patent Owner also asserts that:

- (1) a full-duplex channel sends data “in two directions simultaneously,” i.e., a “forward direction” and a “backward direction”;
- (2) Drake describes LAN 17 as a token-ring network; and
- (3) an ordinarily skilled artisan would have understood that a token-ring network employs only one full-duplex

channel between stations such that a single full-duplex channel in Drake sends data “in two directions simultaneously” between source station 10 and target station 29.

Resp. 23 (citing Ex. 1006, 2:10–13, 4:20–23, 6:66–7:6; Ex. 2070 ¶¶ 84–85, 157–158; Ex. 2078, 185:18–23, 186:4–187:18).

Additionally, Patent Owner contends that the Reply includes improper new first-module theories of unpatentability because Petitioner (1) relies solely on Goossens2003 for disclosing the claimed “first module,” (2) “disavows any reliance” on Drake for disclosing the claimed “first module,” and (3) “also alternatively suggests” that Drake’s application 11 corresponds to the claimed “first module.” Sur-reply 1–2 (emphasis omitted); *see id.* at 19–21, 24–25; Paper 53, 2.

(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 we agree with Petitioner that Goossens2003 alone teaches claim 10’s preamble and that the combined disclosures in Goossens2003 and Drake teach claim 10’s preamble. *See* Pet. 54–61, 68–69; Reply 4, 16–17, 22–23; Ex. 1003 ¶¶ 106–110, 168–172, 174–181, 202–204; Ex. 1043 ¶¶ 13, 100–108.

For the reasons stated by Petitioner and supported by Dr. Mowry’s testimony, Goossens2003 alone teaches claim 10’s preamble. *See* Pet. 54–61, 68–69; Ex. 1003 ¶¶ 168–172, 176, 178, 180, 202–204; Ex. 1043 ¶ 13. For instance, as Petitioner asserts, a master IP in Goossens2003’s SoC corresponds to the claimed “first module,” and a slave IP in Goossens2003’s SoC corresponds to the claimed “second module.” *See* Ex. 1003 ¶¶ 170,

176, 193–194; Ex. 1007, 72 (Figs. 4.4–4.5); Ex. 1043 ¶¶ 13, 74; Pet. 55, 59, 65; Reply 4, 16–17, 21. Also, Goossens2003’s NoC provides connections between IPs in the SoC, and each connection comprises a “request” channel and a “response” channel with “connection properties” that can be independently configured. *See* Ex. 1003 ¶¶ 176, 178; Ex. 1007, 67, 71–74; Pet. 58–60.

Additionally, for the reasons explained below, 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 ¶¶ 106–110, 177, 179, 181; 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; Ex. 1043 ¶¶ 100–108.

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; Ex. 1003 ¶ 110; Ex. 1043 ¶ 107. 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. Ex. 1006, 5:30–50; *see id.* at 6:24–28; Ex. 1003 ¶¶ 106–107; Ex. 1043 ¶¶ 100, 107. For instance, Drake identifies the following QoS parameters as separate QoS 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 the context of Drake’s disclosure, an ordinarily skilled artisan would have understood that (1) “forward” refers to “going from source to target,” (2) “backward” refers to “going from target to source,” and (3) “forward” and “backward” refer to “two channels.” Ex. 1043 ¶ 100; *see* Ex. 1003 ¶ 106; Ex. 2078, 185:18–23. 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. *See* Ex. 1003 ¶¶ 107, 110; Ex. 1043 ¶¶ 100, 107.

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 ¶¶ 107–110. Drake’s 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. Because the QoS parameters are “separately specified for each directional channel” in Drake, an ordinarily skilled artisan “would have understood that these channels can be configured to have different properties,” such that they are “independently configurable” according to claim 10’s preamble. Ex. 1003 ¶ 108.

Regarding Patent Owner’s reliance on Drake’s disclosure of a token-ring network, Drake discloses a token-ring network as an illustrative LAN

and does not limit its teachings to token-ring networks. *See* Ex. 1006, 1:8–11, 2:10–13, 4:22–23, 6:66–67, 7:5–7; Ex. 1037, 63:20–66:4; Ex. 1043 ¶ 102. For instance, Drake states that the invention “relates to . . . insuring [sic] adequate quality of service (QoS) for transmission of multimedia signals in local area networks.” Ex. 1006, 1:8–11; *see* Ex. 1003 ¶ 66. Drake’s abstract describes a “management system for local area networks” that “ensures selected levels of quality of service.” Ex. 1006, code (57); *see* Ex. 1043 ¶ 102. Drake’s claim 1 broadly recites a “local area network.” Ex. 1006, 15:48–16:7; *see* Ex. 1043 ¶ 102. Additionally, Drake identifies the following as illustrative examples of networks: “4 mb Token Ring, 16 mb Token Ring, FDDI asynchronous., etc.”³⁰ Ex. 1006, 7:5–7. Hence, an ordinarily skilled artisan “would have understood that an Ethernet LAN (or any other type of packet-based LAN) would also work perfectly well with Drake.” Ex. 1043 ¶ 102.

Further, a token-ring network may operate in a full-duplex “mode” with two channels between stations. *See* Ex. 1043 ¶¶ 103–106; Ex. 2077, 5, 16, 42–44; Ex. 2088, 149:2–21. “Duplex communication is composed of multiple channels.” Ex. 2088, 149:15–16. Hence, we disagree with Patent Owner that an ordinarily skilled artisan would have understood that a token-ring network employs only one full-duplex channel between stations. *See* Resp. 23.

For the reasons stated in the Order denying Patent Owner’s motion to strike and the Decision denying Patent Owner’s request for rehearing,

³⁰ The acronym “FDDI” stands for “Fiber Distributed Data Interface.”

the Reply does not include improper new first-module theories of unpatentability. *See* Paper 64, 15–19; Paper 68, 9–16; 37 C.F.R. § 42.23(b).

(b) Limitation 10.a

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).

(i) Petitioner’s Contentions

Petitioner contends that the combined disclosures in Goossens2003 and Drake teach limitation 10.a. *See* Pet. 35–36, 40–41, 62–63, 65–67, 69; Reply 16. Specifically, Petitioner asserts that Goossens2003 discloses that:

- (1) the SoC includes network interfaces (NIs) positioned between the IPs and the NoC;
- (2) the network interfaces “translate between the ‘transport layer’ utilized by the IPs to request services and the ‘network layer’ utilized by” the NoC’s routers to transport data;
- (3) the network interfaces implement “end-to-end” connection properties, i.e., properties relating to the interactions between master IPs and slave IPs, including “reordering, transaction completion, and flow control”;
- (4) the IPs “negotiate with network interfaces to obtain connections with certain properties” and reserve network resources;
- (5) “the requested connections are between a ‘master’ (i.e., first module) and ‘one or more slaves’ (i.e., second modules)”;
- (6) when the IPs “make a request for a connection, the desired communication properties and level of service ‘must be stated explicitly.’”

Pet. 62–63, 65, 67–68 (emphases omitted) (quoting Ex. 1007, 67, 76–77) (citing Ex. 1003 ¶¶ 185, 194).

Petitioner asserts that Goossens2003’s disclosure that the IPs “negotiate with network interfaces to obtain connections with certain properties” and reserve network resources is “just like” the ’449 patent’s description of the interaction between the claimed “modules” and the claimed “communication manager.” Pet. 62 (citing Ex. 1001, 10:3–54). According to Petitioner, an ordinarily skilled artisan would have understood that the service requests issued by Goossens2003’s IPs comprise “desired connection properties” according to limitation 10.a. *Id.* at 65 (citing Ex. 1003 ¶ 194).

Petitioner contends that Goossens2003’s network interface includes the claimed “communication manager” under the construction that Patent Owner proposed in the TI litigation, i.e., a “circuit that manages communication between modules.” Pet. 62–63 (citing Ex. 1003 ¶ 186; Ex. 1019, 12); *see* Reply 16; Ex. 1019, 12–13; Ex. 2022, 38. According to Petitioner, the ’449 patent “expressly teaches” implementing the claimed “communication manager” as part of a network interface. Reply 16 (citing Ex. 1001, 10:5–6).

Additionally, Petitioner contends that Drake’s QoS requestor manager 12 corresponds to the claimed “communication manager” even under the construction adopted by the district courts in the TI litigation and the Samsung litigation because QoS requestor manager 12:

- (1) manages the communication between different modules, for example, by “assembl[ing] a request to reserve a QoS connection for a multi-media data stream . . . between source station 10 and target station 29”;

- (2) forwards a request to reserve a QoS connection to QoS allocator 20 (mapped to the claimed “resource manager”);
- (3) may “either accept or reject connections established by” QoS allocator 20 “based on the specified QoS parameters”; and
- (4) may request that QoS allocator 20 “release reserved connections and resources,” e.g., by sending a QoS de-allocation announcement.

Pet. 35–36, 40–41, 63, 66 (alterations by Petitioner) (quoting Ex. 1006, 4:35–37); *see* Reply 17–19; Tr. 14:1–22.

Petitioner explains that application 11 in Drake’s source station 10 is “the thing specifically making the service request.” Reply 3 (citing Pet. 27, 40–41, 59, 65–66; Ex. 1003 ¶¶ 129–131, 177, 195; Ex. 1043 ¶¶ 12–15); *see id.* at 3–4 (citing Ex. 1006, 4:27–29; Ex. 2078, 171:21–176:3). As support, Petitioner quotes Drake’s disclosure that application 11 “requests a QoS connection to the destination or target station 29.” Reply 4 (quoting Ex. 1006, 4:28–30); *see* Ex. 1037, 53:4–18; Ex. 2078, 144:16–145:7.

Petitioner also explains that application 11 communicates the service request to QoS requestor manager 12 for “subsequent transmission” to QoS allocator 20 (mapped to the claimed “resource manager”). Pet. 41 (citing Ex. 1003 ¶ 130; Ex. 1006, 3:21–28, 4:32–37, 4:50–54, 4:62–65, 5:5–8, Fig. 1); *see id.* at 66. According to Petitioner, QoS allocator 20 “receives, decodes and acts upon the QoS request from source station 10.” *Id.* at 36 (quoting Ex. 1006, 5:6–8).

(ii) Patent Owner’s Contentions

Patent Owner disputes that the combined disclosures in Goossens2003 and Drake teach limitation 10.a. *See* Resp. 47–62; Sur-reply 20–21. In

particular, Patent Owner contends that “it is unclear” whether Petitioner maps the claimed “communication manager” to Goossens2003’s network interface, Drake’s QoS requestor manager 12, or “some combination of both.” Resp. 47–48, 56 n.8. Patent Owner contends that Petitioner (1) refuses to “identify what component in Drake” corresponds to Goossens2003’s IP (mapped to the claimed “first module”) and (2) “fails to show” that “the first module issu[es] a request for a connection . . . to a communication manager” as required by limitation 10.a. Sur-reply 21.

Patent Owner contends that Petitioner “provides no explanation for why or how Goossens2003’s NI would work together with any aspects of Drake,” such as Drake’s QoS requestor manager 12 or QoS allocator 20. Resp. 48 (citing Pet. 62–63). Patent Owner contends that Petitioner fails to explain (1) why an ordinarily skilled artisan would have implemented Drake’s QoS requestor manager 12 in Goossens2003 and (2) how QoS requestor manager 12 “would work with Goossens2003.” *Id.* at 47, 49, 57 (citing Pet. 51–54, 62–63).

Patent Owner notes that Petitioner identifies “an alleged first module” in each of Goossens2003 and Drake that requests a connection, i.e., Goossens2003’s master IP and application 11 in Drake’s source station 10. Resp. 56 (citing Pet. 65). Patent Owner also notes that Petitioner asserts that application 11 in Drake’s source station 10 “directs these requests to a ‘QoS requestor manager.’” *Id.* (quoting Pet. 65–66). Patent Owner then contends that Petitioner offers “no motivation for incorporating this further step into Goossens2003” to “modify Goossens2003 such that its IP issues a request to a QoS requestor manager.” *Id.* at 56–57 (quoting Pet. 65–66).

Patent Owner asserts that an ordinarily skilled artisan would have had “no reason to incorporate this further step into Goossens2003.” Resp. 57; *see id.* at 58–59. Patent Owner explains that if “Drake’s QoS allocator was implemented in Goossens2003 as Petitioner alleges,” then an ordinarily skilled artisan “considering the combination would have understood that Goossens2003’s IP would just send its request directly to the QoS allocator, not to a QoS requestor manager ‘for subsequent transmission to [the] QoS allocator’ as Petitioner suggests.” *Id.* at 57 (alteration by Patent Owner) (quoting Pet. 41); *see id.* at 58–59. According to Patent Owner, “[i]t would have been redundant and unnecessary for a request issued by Goossens2003’s IP to be sent to and issued again by a QoS requestor manager.” *Id.* at 57 (emphasis omitted).

Patent Owner argues that there are three problems with Petitioner’s contention that Goossens2003’s network interface includes the claimed “communication manager.” Resp. 61 (citing Pet. 62–63). First, Patent Owner asserts that (a) the claimed “communication manager” must communicate with the claimed “resource manager” and (b) Goossens2003 does not disclose the claimed “resource manager.” *Id.* Second, Patent Owner asserts that Petitioner’s argument rests on Patent Owner’s proposed claim construction that “was not adopted by the court” in the TI litigation or the Samsung litigation. *Id.* Third, Patent Owner asserts that (a) the claimed “communication manager” and the claimed “network interface means” are “separate elements” and (b) Petitioner makes “no attempt” to explain how the “same element” can act as both the claimed “communication manager” and the claimed “network interface means.” *Id.*

Patent Owner contends that Drake's QoS requestor manager 12 cannot correspond to the claimed "communication manager" because QoS requestor manager 12 "is completely within source station 10" and does not forward "the request it receives" to Drake's QoS allocator 20. Resp. 61–62 (citing Ex. 2070 ¶ 278). Patent Owner also contends that Petitioner makes "no attempt" to show that Drake's QoS requestor manager 12 corresponds to the claimed "communication manager" as construed by the district courts in the TI litigation and the Samsung litigation. *Id.* at 16, 39, 61.

Additionally, Patent Owner contends that Petitioner's explanation about locating Drake's QoS components outside of Goossens2003's IPs in the proposed combination contradicts Petitioner's position that an IP "corresponds to Drake's source station." Sur-reply 21.

(iii) Analysis

For the reasons explained below, we agree with Petitioner that the combined disclosures in Goossens2003 and Drake teach limitation 10.a. *See* Pet. 35–36, 40–41, 55, 59, 62–63, 65–67, 69; Reply 4, 16–17, 21; Ex. 1003 ¶¶ 70, 118–121, 129–130, 158, 170, 176, 178, 184–187, 193–196, 199–200, 205; Ex. 1043 ¶¶ 13–15.

First, as discussed above, a master IP in Goossens2003's SoC corresponds to the claimed "first module," and a slave IP in Goossens2003's SoC corresponds to the claimed "second module." *See* Ex. 1003 ¶¶ 170, 176, 193–194; Ex. 1007, 72 (Figs. 4.4–4.5); Ex. 1043 ¶¶ 13, 74; Pet. 55, 59, 65; Reply 4, 16–17, 21; *supra* § III.E.4(a)(iii).

Second, as Petitioner asserts, Goossens2003 discloses that:

- (1) the SoC includes network interfaces (NIs) positioned between the IPs and the NoC;

- (2) the network interfaces “translate between the ‘transport layer’ utilized by the IPs to request services and the ‘network layer’ utilized by” the NoC’s routers to transport data;
- (3) the network interfaces implement “end-to-end” connection properties, i.e., properties relating to the interactions between master IPs and slave IPs, including “reordering, transaction completion, and flow control”;
- (4) the IPs “negotiate with network interfaces to obtain connections with certain properties” and reserve network resources;
- (5) “the requested connections are between a ‘master’ (i.e., first module) and ‘one or more slaves’ (i.e., second modules)”;
- (6) when the IPs “make a request for a connection, the desired communication properties and level of service ‘must be stated explicitly.’”

Ex. 1007, 67, 71–72, 74–77; *see* Ex. 1003 ¶¶ 185, 193–194, 199; Pet. 62–63, 65, 67–68. Accordingly, an ordinarily skilled artisan would have understood that the service requests issued by Goossens2003’s IPs comprise “desired connection properties” according to limitation 10.a. Ex. 1003 ¶ 194.

Third, the “desired connection properties” are “associated with the sets of communication channels” according to limitation 10.a because each connection in Goossens2003’s NoC comprises a “request” channel and a “response” channel with “connection properties” that can be independently configured. *See* Ex. 1003 ¶ 178; Ex. 1007, 71–74; *supra* § III.E.4(a)(iii). According to Goossens2003, connections are created during a “negotiation phase” of a “resource management” process by “stating the requested service level,” i.e., with an IP’s requirements “stated explicitly.”

Ex. 1007, 65, 67, 71; *see* Ex. 1003 ¶¶ 70, 158, 194.

Fourth, as discussed above, Goossens2003 discloses providing communication-management functionality in a network interface of the NoC. *See* Ex. 1003 ¶¶ 185–186; Ex. 1007, 74, 76–77; Ex. 1043 ¶¶ 19, 29, 76; Ex. 2088, 95:14–21; *supra* § III.E.3(e)(i).d. For example, Goossens2003 explains that:

- (1) IPs “negotiate with network interfaces to obtain connections with certain properties,” including “reordering, transaction completion, and flow control”; and
- (2) “network interfaces may reserve resources.”

Ex. 1007, 76–77; *see* Ex. 1003 ¶¶ 185, 193, 199.

Hence, part of a network interface in Goossens2003’s NoC manages the communication between different modules and corresponds to the claimed “communication manager.” Ex. 1003 ¶ 186. Also, in Goossens2003’s SoC, the claimed “communication manager” (part of a network interface in the NoC) is separate and distinct from the claimed “first module” (a master IP in the SoC). *See supra* § III.E.4(a)(iii).

Fifth, as Petitioner asserts, Drake’s QoS requestor manager 12 also corresponds to the claimed “communication manager” because QoS requestor manager 12:

- (1) manages the communication between different modules, for example, by “assembl[ing] a request to reserve a QoS connection for a multi-media data stream . . . between source station 10 and target station 29”;
- (2) forwards a request to reserve a QoS connection to QoS allocator 20 (mapped to the claimed “resource manager”);

- (3) may “either accept or reject connections established by” QoS allocator 20 “based on the specified QoS parameters”; and
- (4) may request that QoS allocator 20 “release reserved connections and resources,” e.g., by sending a QoS de-allocation announcement.

See Ex. 1003 ¶¶ 118–120, 129–130, 187, 196; Ex. 1006, 2:32–41, 3:21–28, 4:26–37, 4:62–65, 5:5–8, 5:25–50, 8:20–29, 8:65–9:3, 11:49–12:34, 13:13–15, code (57), Figs. 1, 6–8; Pet. 35–36, 40–41, 63; Tr. 14:1–22.

Also, as discussed above, Drake discloses QoS requestor manager 12 sending and receiving several QoS messages used for QoS management that Goossens2003 does not disclose, such as QoS messages with “allocation confirmations, de-allocation requests, allocation change requests and allocation change confirmations.” *See* Ex. 1003 ¶ 120; Ex. 1006, 3:21–28, 8:20–29, 8:65–9:3, 11:49–12:34; *supra* § III.E.3(e)(i).g.

Sixth, as Petitioner explains, application 11 in Drake’s source station 10 is “the thing specifically making the service request.” *See* Ex. 1006, 4:27–32; Ex. 1043 ¶¶ 14–15; Reply 3. As “the thing specifically making the service request,” application 11 corresponds to Goossens2003’s IP making a service request to a network interface. *See* Ex. 1043 ¶¶ 14, 75; Ex. 2078, 174:23–176:3; Ex. 2088, 175:4–16, 179:8–180:15, 183:2–14, 184:10–12. Patent Owner acknowledges that Dr. Mowry “clarified” at his first deposition that “only the application 11 within source station 10 corresponds to the claimed ‘first module.’” *See* Resp. 18–19 (emphasis omitted) (citing Ex. 2078, 173:8–13, 174:10–19, 174:23–175:19, 175:21–176:2). Hence, we disagree with Patent Owner that Petitioner refuses to “identify what component in Drake” corresponds to

Goossens2003's IP (mapped to the claimed "first module"). *See* Sur-reply 21.

Seventh, the analysis above about motivation to combine addresses Patent Owner's contentions concerning alleged redundancy and Petitioner's alleged failure to explain (1) why an ordinarily skilled artisan would have implemented Drake's QoS requestor manager 12 in Goossens2003 and (2) how QoS requestor manager 12 "would work with Goossens2003." *See* Resp. 47, 49–50, 56–59; *supra* §§ III.E.3(e)(i).a, III.E.3(e)(i).d, III.E.3(e)(i).g.

As for Patent Owner's contention that "it is unclear" whether Petitioner maps the claimed "communication manager" to Goossens2003's network interface, Drake's QoS requestor manager 12, or "some combination of both," the Petition and the Reply indicate that Petitioner presents alternative arguments depending on how the Board construes the term "communication manager." *See* Pet. 35–36, 40–41, 62–63; Resp. 47–48, 56 n.8; Reply 16.

As for Patent Owner's contention that Goossens2003 does not disclose the claimed "communication manager" because (a) the claimed "communication manager" must communicate with the claimed "resource manager" and (b) Goossens2003 does not disclose the claimed "resource manager," other limitations address communication between these claim elements, e.g., limitations 10.b and 10.d. *See* Ex. 1001, 19:36–37 (limitation 10.b), 20:1–2 (limitation 10.d). Patent Owner did not propose a construction for the claimed "communication manager" such that it must communicate with the claimed "resource manager." *See* Resp. 12–16; Sur-reply 2, 20; Tr. 31:1–13, 61:22–62:4.

Further, that Goossens2003 does not disclose the claimed “resource manager” does not matter. Petitioner relies on Drake for disclosing the claimed “resource manager,” not Goossens2003. *See* Pet. 24–25, 33–34, 57–58, 61–62; Ex. 1003 ¶¶ 91–92, 113–116, 173, 181. Where obviousness rests on a combination of references, a patentee cannot establish nonobviousness by attacking the references individually. *See In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986).

As for Patent Owner’s contention that Goossens2003 does not disclose the claimed “communication manager” because the claimed “communication manager” and the claimed “network interface means” are “separate elements,” the claims do not preclude these “separate elements” from residing in the same entity, e.g., in Goossens2003’s network interface. *See* Ex. 1001, 18:32–48, 19:17–20:6. Additionally, the ’449 patent explains that the “communication manager” may reside in “one or some of the network interfaces.” Ex. 1001, 10:3–6. Moreover, Patent Owner admits that the ’449 patent describes “the ‘communication manager’ as being arranged in a ‘network,’ a ‘router network,’ or a ‘network interface means.’” Ex. 1020, 19; *see* Resp. 14 (citing Ex. 1001, 10:3–6).

As for Patent Owner’s contention that Drake’s QoS requestor manager 12 cannot correspond to the claimed “communication manager” because QoS requestor manager 12 “is completely within source station 10” and does not forward “the request it receives” to Drake’s QoS allocator 20, we disagree. *See* Resp. 61–62. As discussed above, an ordinarily skilled artisan would have recognized that QoS requestor manager 12 sends and receives QoS messages when interacting with application 11 to communicate information in both directions. *See* Ex. 1006, 3:21–28,

3:49–65, 4:62–65, 11:22–26, 11:30–33, 11:36–38, 11:52–56, 12:39–42, 12:48–52, 12:64–67, 13:2–7, 13:13–15, 13:28–33; Ex. 1043 ¶¶ 15, 83–86, 90–93; *supra* § III.E.3(e)(i).g.

For instance, after a service request originates from application 11, QoS requestor manager 12 sends (forwards) the service request to QoS allocator 20. Ex. 1043 ¶¶ 83, 85–86; *see* Ex. 1003 ¶¶ 130–131; Ex. 1006, 4:30–40, 4:62–65; *supra* § III.E.3(e)(i).g. QoS requestor manager 12 forwards the service request “in the sense of redirecting communication” in that QoS requestor manager 12 “realizes the request should be sent” to QoS allocator 20 instead of target station 29. Ex. 1043 ¶ 86.

As for Patent Owner’s contention that Petitioner’s explanation about locating Drake’s QoS components outside of Goossens2003’s IPs in the proposed combination contradicts Petitioner’s position that an IP “corresponds to Drake’s source station,” Petitioner explains that application 11 in Drake’s source station 10 is “the thing specifically making the service request.” *See* Reply 3; Sur-reply 21; Ex. 1006, 4:27–32; Ex. 1043 ¶¶ 14–15. As “the thing specifically making the service request,” application 11 corresponds to Goossens2003’s IP making a service request to a network interface. *See* Ex. 1043 ¶¶ 14, 75; Ex. 2078, 174:23–176:3; Ex. 2088, 175:4–16, 179:8–180:15, 183:2–14, 184:10–12.

For the reasons discussed above, the combined disclosures in Goossens2003 and Drake teach limitation 10.a, and Patent Owner’s contentions to the contrary lack merit.

(c) Limitation 10.b

Claim 10 recites “the communication manager forwarding the request to a resource manager.” Ex. 1001, 19:36–37 (limitation 10.b).

(i) Petitioner's Contentions

Petitioner contends that the combined disclosures in Goossens2003 and Drake teach limitation 10.b. *See* Pet. 24–25, 41–42, 57, 60, 66, 69; Reply 17–19. Specifically, Petitioner asserts that Drake's QoS requestor manager 12 (mapped to the claimed "communication manager") receives "a request for a connection" from application 11 in source station 10 and then "assemble[s] a request to reserve a QoS connection" using "QoS protocol machine 13 to format the QoS request." Pet. 41, 66 (alteration by Petitioner) (quoting Ex. 1006, 4:35, 4:64–65); *see* Reply 17. Petitioner asserts that QoS requestor manager 12 forwards the QoS request to QoS allocator 20. Pet. 42, 66; *see* Reply 17.

Further, Petitioner asserts that QoS allocator 20 corresponds to the claimed "resource manager" because QoS allocator 20:

- (1) "receives requests for connections with certain properties" indicated by "quality-of-service parameters that describe the service expected from the network," including throughput and latency (called "end-to-end delay"); and
- (2) "examines the resources of the network to determine whether those requests can be satisfied."

Pet. 24 (citing Ex. 1003 ¶¶ 91–92; Ex. 1006, 2:14–21, 2:32–41, 2:65–3:6, 4:22–25, 4:49–54, 4:66–5:23, 5:30–50, 10:41–11:48, code (57), Figs. 1–2, 4–5); *see id.* at 25.

To support its assertions, Petitioner provides an annotated and highlighted version of Drake's Figure 1 as reproduced below (Pet. 25):

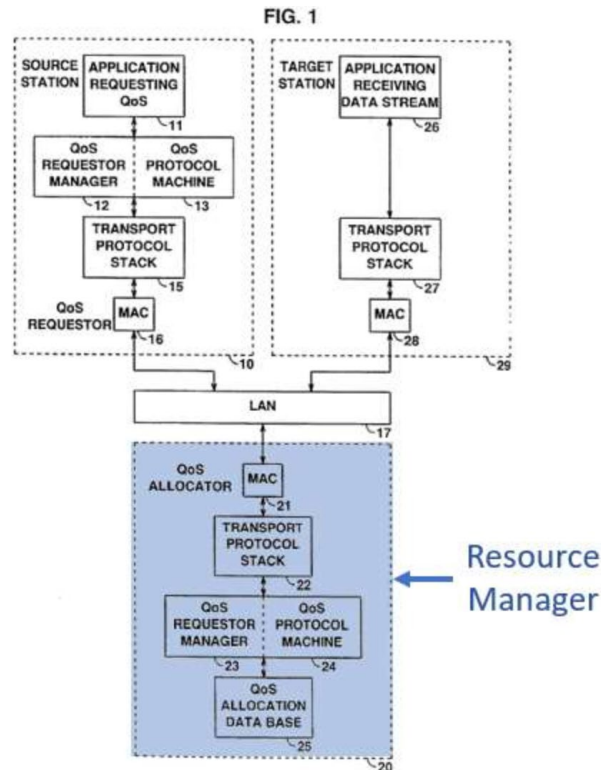


Figure 1 depicts a QoS management system. Ex. 1006, 3:36–40, Fig. 1. The above annotated and highlighted version of Figure 1 includes (1) blue highlighting over QoS allocator 20 and (2) the blue annotation “Resource Manager” identifying QoS allocator 20. *See* Pet. 25; Ex. 1003 ¶ 93.

Regarding the components in Drake's source station 10 located between QoS requestor manager 12 and LAN 17, Petitioner asserts that an ordinarily skilled artisan would have understood that QoS requestor manager 12 “forward[s] the request” according to limitation 10.b because Drake's Figure 1 shows “only one path” from application 11 through the components in source station 10, i.e., the path through QoS requestor manager 12. Reply 17–18 (citing Ex. 1043 ¶ 84).

To support its assertion, Petitioner provides an annotated version of Drake's Figure 1 as reproduced below (Reply 18):

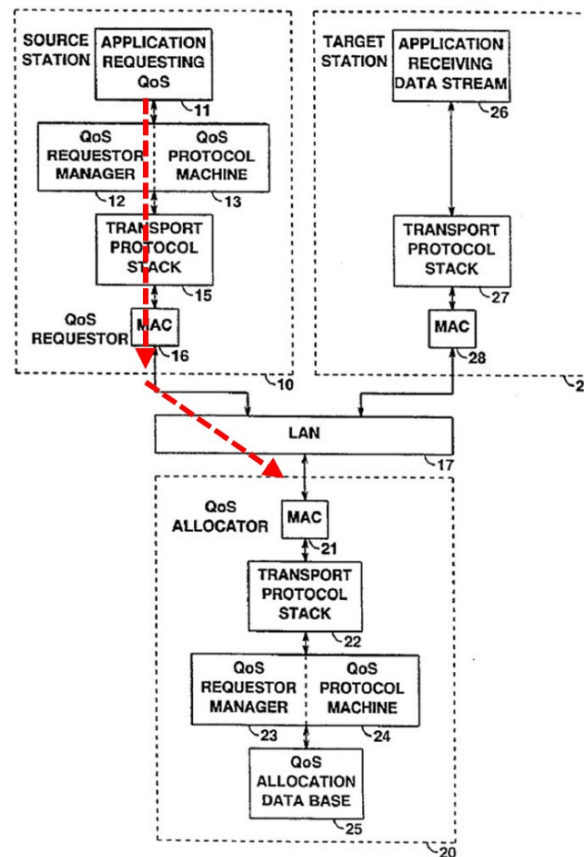


Figure 1 depicts a QoS management system. Ex. 1006, 3:36–40, Fig. 1. The above annotated version of Figure 1 includes two red arrows as follows:

- (1) a red arrow from application 11 in source station 10 through (a) QoS requestor manager 12/QoS protocol machine 13, (b) transport protocol stack 15, and (c) MAC entity 16 in source station 10; and
- (2) a red arrow from source station 10 through LAN 17 to QoS allocator 20.

See Reply 18; Ex. 1043 ¶ 83.

According to Petitioner, “[n]othing in the claim language precludes the possibility that the request forwarded by the communication manager

passes through other components before reaching the resource manager.”
Reply 19 (citing Ex. 1043 ¶ 87).

Additionally, Petitioner asserts that Goossens2003 discloses that:

- (1) the NoC provides connections between IPs in the SoC;
- (2) each connection comprises a “request” channel and a “response” channel; and
- (3) “these channels have ‘connection properties,’ including flow control and throughput guarantees, that ‘can be independently configured.’”

Pet. 60 (citing Ex. 1003 ¶ 178; 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.* (quoting Ex. 1001, 11:20–22).

(ii) Patent Owner’s Contentions

Patent Owner disputes that the combined disclosures in Goossens2003 and Drake teach limitation 10.b. *See* Resp. 41–42, 45–47, 54–55, 58–60, 62; Sur-reply 22–23. In particular, Patent Owner contends that “Drake does not teach that QoS requestor manager 12 (alleged ‘communication manager’) forwards the request it receives to QoS allocator 20 (alleged ‘resource manager’).” Resp. 41, 62 (citing Ex. 2070 ¶ 219); *see* Sur-reply 22.

Patent Owner contends that Drake teaches that:

- (1) “the request received by QoS allocator 20 is sent from source station 10,” not from QoS requestor manager 12 in source station 10;
- (2) “QoS requestor manager 12, along with QoS protocol machine 13, merely ‘assemble[s]’ and ‘format[s]’ a request and sends it to transport protocol stack 15, not

that QoS requestor manager 12 actually forwards sends [sic] the request to QoS allocator 20”; and

- (3) after “QoS requestor manager 12 assembles/formats the request, source station 10 uses transport protocol stack 15 and MAC entity 16 for formatting and launching on LAN 17, respectively, a request packet for sending the request to QoS allocator 20.”

Resp. 41–42 (alterations by Patent Owner) (citing Ex. 1006, 4:32–40, 4:50–54, 4:62–65, 5:5–8, 9:52–10:8, 10:41–46, Figs. 1, 3–4; Ex. 2070 ¶¶ 220–221; Inst. Dec. 35–36, 39; Paper 14, 34–35). According to Patent Owner, QoS requestor manager 12 assembles/formats a QoS request, and assembling/formatting the request does not constitute “forwarding the request” according to limitation 10.b. Sur-reply 22.

Patent Owner contends that Petitioner’s assertion in the Reply that Drake’s Figure 1 shows “only one path” from application 11 through the components in source station 10 is an “improper new argument.” Sur-reply 22.

Additionally, Patent Owner contends that Drake’s Figure 1 shows a “path” where QoS requestor manager 12 sends a request to transport protocol stack 15, not to QoS allocator 20, and then source station 10 (or “component 15 and/or 16 therein”) sends the request to QoS allocator 20. Sur-reply 22; *see id.* at 22–23 (citing Ex. 1036, 2; Ex. 1037, 55:22–56:5; Ex. 2070 ¶¶ 219–224, 286–291). According to Patent Owner, Drake contains “zero support” for the assertion that QoS requestor manager 12 “forwards the request” to QoS allocator 20 “through other components.” *Id.* at 22 (citing Resp. 41–42, 62).

(iii) Analysis

For the reasons explained below, we agree with Petitioner that the combined disclosures in Goossens2003 and Drake teach limitation 10.b. *See* Pet. 24–25, 41–42, 57, 60, 66, 69; Reply 17–19; Ex. 1003 ¶¶ 91–93, 116, 129–131, 150, 173, 178–179, 196, 206; Ex. 1043 ¶¶ 15, 45, 83–87.

First, for the reasons stated by Petitioner and supported by Dr. Mowry’s testimony, we agree with Petitioner that Drake’s QoS allocator 20 corresponds to the claimed “resource manager.” *See* Pet. 24–25, 41–42, 57; Ex. 1003 ¶¶ 91–93, 129–130, 173; Ex. 1043 ¶ 45. For example, Drake explains that QoS allocator 20 “manages the QoS requests for the entire LAN 17” and “utilizes the data in QoS allocation data base 25” when managing network resources. Ex. 1006, 4:66–67, 5:5–9; *see id.* at 4:24–26, code (57); Ex. 1003 ¶¶ 116, 150.

Second, as Petitioner asserts, QoS requestor manager 12 forwards a QoS request to QoS allocator 20 such that “the communication manager forward[s] the request to a resource manager” according to limitation 10.b. *See* Pet. 42, 66; Reply 17–19; Ex. 1003 ¶¶ 130–131, 196; Ex. 1043 ¶¶ 83–87. Specifically, regarding source station 10, Drake discloses that:

- (1) QoS requestor manager 12 “interacts with application 11 using internal messages as is well known in the art,” e.g., to cause “multimedia data to be transported from a multimedia data base” through LAN 17 to target station 29;
- (2) 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”;
- (3) QoS requestor manager 12 “utilizes QoS protocol machine 13 to format the QoS request”;

(4) transport protocol stack 15 formats a request packet for LAN 17; and

(5) MAC entity 16 launches the request packet on LAN 17.

Ex. 1006, 4:30–40, 4:58–60, 4:62–65, Fig. 1; *see* Ex. 1003 ¶¶ 67, 130–131, 196; Ex. 1043 ¶ 83.

After MAC entity 16 launches the request packet on LAN 17, the request packet travels through LAN 17 to QoS allocator 20, and QoS allocator 20 “receives, decodes and acts upon the QoS request from source station 10.” Ex. 1006, 5:5–8, Fig. 1; *see* Ex. 1003 ¶ 131; Ex. 1043 ¶ 83.

Thus, after a service request originates from application 11, QoS requestor manager 12 forwards the service request to QoS allocator 20. Ex. 1043 ¶¶ 83–86; *see* Ex. 1003 ¶¶ 130–131; Ex. 1006, 4:30–40, 4:62–65; *supra* § III.E.3(e)(i).g. QoS requestor manager 12 forwards the service request “in the sense of redirecting communication” in that QoS requestor manager 12 “realizes the request should be sent” to QoS allocator 20 instead of target station 29. Ex. 1043 ¶ 86.

Although Drake describes the service request as sent from source station 10 to QoS allocator 20, an ordinarily skilled artisan would have understood that QoS requestor manager 12 forwards the service request to QoS allocator 20 because:

- (1) the service request originates from application 11; and
- (2) Drake’s Figure 1 shows only one path from application 11 through the components in source station 10 to LAN 17 and ultimately to QoS allocator 20, i.e., the path through QoS requestor manager 12.

See Ex. 1006, 3:36–40, 4:30–40, 4:50–54, Fig. 1; Ex. 1043 ¶¶ 15, 83–85.

Hence, we disagree with Patent Owner that Drake contains “zero support”

for the assertion that QoS requestor manager 12 “forwards the request” to QoS allocator 20 “through other components.” *See* Sur-reply 22.

Third, we disagree with Patent Owner that Petitioner’s assertion in the Reply that Drake’s Figure 1 shows “only one path” from application 11 through the components in source station 10 is an “improper new argument.” *See* Sur-reply 22. That assertion in the Reply properly responds to Patent Owner’s contentions in the Response that Drake does not teach “forwarding the request” according to limitation 10.b and instead teaches that:

- (1) “the request received by QoS allocator 20 is sent from source station 10,” not from QoS requestor manager 12 in source station 10;
- (2) “QoS requestor manager 12, along with QoS protocol machine 13, merely ‘assemble[s]’ and ‘format[s]’ a request and sends it to transport protocol stack 15, not that QoS requestor manager 12 actually forwards sends [sic] the request to QoS allocator 20”; and
- (3) after “QoS requestor manager 12 assembles/formats the request, source station 10 uses transport protocol stack 15 and MAC entity 16 for formatting and launching on LAN 17, respectively, a request packet for sending the request to QoS allocator 20.”

See Resp. 41–42, 62; Reply 17–18; *Rembrandt*, 76 F.4th at 1384–85; *Andrea Elecs.*, 949 F.3d at 706–07; 37 C.F.R. § 42.23(b).

Fourth, limitation 10.b requires “forwarding the request to a resource manager” and does not exclude “forwarding the request” through intermediaries, such as interface components and routers. Ex. 1001, 19:36–37; *see* Ex. 1043 ¶ 87. Consistent with this, the ’449 patent explains that the “communication manager” and the “resource manager” may reside in “one or some of the network interfaces” or “the router network.”

Ex. 1001, 10:3–6. Moreover, Patent Owner admits that the '449 patent describes (1) “the ‘communication manager’ as being arranged in a ‘network,’ a ‘router network,’ or a ‘network interface means’” and (2) “the ‘resource manager’ [as being] arranged in a network or a network interface means.” Ex. 1020, 19, 22; *see* Resp. 14 (citing Ex. 1001, 10:3–6).

If the “communication manager” and the “resource manager” are arranged in different network interfaces, then “forwarding the request to [the] resource manager” according to limitation 10.b could involve “forwarding the request” through intermediaries, such as interface components and routers.

For the reasons discussed above, the combined disclosures in Goossens2003 and Drake teach limitation 10.b, and Patent Owner’s contentions to the contrary lack merit.

(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).

(i) Petitioner’s Contentions

Petitioner contends that the combined disclosures in Goossens2003 and Drake teach limitation 10.c. *See* Pet. 32–34, 61–62, 69. Specifically, Petitioner asserts that Goossens2003 discloses that “when requests for connections are issued by IPs,” the NoC “will honour the request if [the NoC] has sufficient resources available, and will reject it otherwise.” *Id.* at 61 (quoting Ex. 1007, 67).

Further, Petitioner asserts that Drake’s QoS allocator 20 (mapped to the claimed “resource manager”) 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. 32–33, 61–62 (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 QoS database. *Id.* at 34 (alteration by Petitioner) (quoting Ex. 1006, 10:47–49). According to Petitioner, the QoS database contains “information regarding the components of the network and the resources reserved by previously allocated connections.” *Id.* (citing Ex. 1006, 5:8–14, 10:60–11:48).

Additionally, Petitioner contends that QoS allocator 20 determines resource availability “just like” the “resource manager” disclosed in the ’449 patent that determines resource availability “based on network, channel, and connection properties that are maintained in a ‘property table.’” Pet. 34 (citing Ex. 1001, 10:34–40; Ex. 1003 ¶¶ 115–116).

(ii) Patent Owner’s Contentions

Patent Owner disputes that the combined disclosures in Goossens2003 and Drake teach limitation 10.c. *See* Resp. 54, 60. In particular, Patent Owner contends that Petitioner fails to explain where Drake’s QoS allocator 20 would “purportedly receive requests from in the alleged combination with Goossens2003,” e.g., from the IPs or from “somewhere else.” *Id.* at 54 (citing Pet. 61–62).

(iii) Analysis

For the reasons stated by Petitioner and supported by Dr. Mowry’s testimony, we agree with Petitioner that the combined disclosures in

Goossens2003 and Drake teach limitation 10.c. *See* Pet. 32–34, 61–62, 69; Ex. 1003 ¶¶ 113–116, 182–183, 207.

Additionally, the analysis above about motivation to combine addresses Patent Owner’s contention concerning Petitioner’s alleged failure to explain where Drake’s QoS allocator 20 would “purportedly receive requests from in the alleged combination with Goossens2003.” *See* Resp. 54; *supra* § III.E.3(e)(i).c. As discussed above, Petitioner explains that the proposed combination “itself shows where” Drake’s QoS allocator 20 would receive service requests from, i.e., from “Goossens2003’s IP module (the unit making the request) through Drake’s QoS requestor manager 12 (data path shown in Drake).” Reply 14 (citing Pet. 61–62; Ex. 1043 ¶¶ 43–45); *see supra* § III.E.3(e)(i).c.

With Drake’s QoS requestor manager 12 and QoS allocator 20 implemented in Goossens2003’s SoC as explained in the analysis above about motivation to combine, we agree with Petitioner regarding how QoS allocator 20 would receive service requests. *See* Reply 14; Ex. 1043 ¶¶ 45–46; *supra* §§ III.E.3(e)(i).c–e.

For the reasons discussed above, the combined disclosures in Goossens2003 and Drake teach limitation 10.c, and Patent Owner’s contentions to the contrary lack merit.

(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).

(i) Petitioner's Contentions

Petitioner contends that the combined disclosures in Goossens2003 and Drake teach limitation 10.d. *See* Pet. 42–43, 66, 69; Reply 19–21. 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.” Pet. 42, 66 (emphasis omitted) (quoting Ex. 1006, 10:44–45). Petitioner asserts that after QoS allocator 20 makes its determination, QoS allocator 20 “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 66 (emphasis omitted); *see id.* at 42–43 (citing Ex. 1006, 4:55–57, 8:20–29, 8:50–64, Fig. 5).

Petitioner explains that application 11 in Drake's source station 10 is “the thing specifically making the service request.” Reply 3 (citing Pet. 27, 40–41, 59, 65–66; Ex. 1003 ¶¶ 129–131, 177, 195; Ex. 1043 ¶¶ 12–15); *see id.* at 3–4 (citing Ex. 1006, 4:27–29; Ex. 2078, 171:21–176:3). According to Petitioner, an ordinarily skilled artisan would have understood that “the only way Drake's QoS system works is for the reply from QoS allocator 20 to get back to application 11,” i.e., the entity that “made the QoS request in the first place.” *Id.* at 19 (citing Ex. 1037, 59:22–60:2; Ex. 1043 ¶ 93).

Further, Petitioner asserts that Drake's Figure 1 “only shows one path” through the components in source station 10 for the reply from QoS allocator 20 to reach application 11, i.e., the path through QoS requestor manager 12. Reply 19–20. Petitioner asserts that Figure 1's “one path” goes

“first to the QoS requestor manager 12 that interfaces with application 11” such that “reply data reaching application 11 is first sent to the QoS requestor manager 12” since “no bypass is indicated.” *Id.* at 20–21 (citing Ex. 1037, 60:3–61:13; Ex. 1043 ¶¶ 91–92).

To support its assertions, Petitioner provides an annotated version of Drake’s Figure 1 as reproduced below (Reply 20):

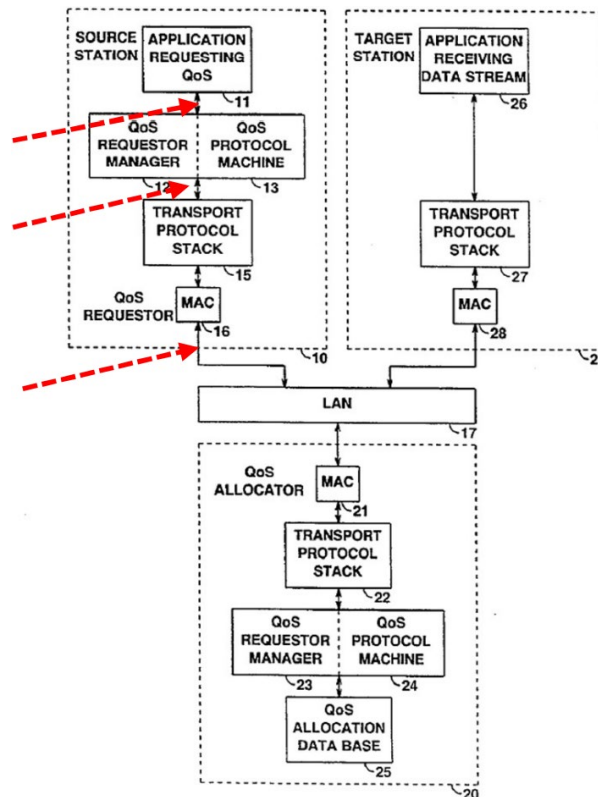


Figure 1 depicts a QoS management system. Ex. 1006, 3:36–40, Fig. 1. The above annotated version of Figure 1 includes three red arrows as follows:

- (1) a lower red arrow identifying the bidirectional path between LAN 17 and MAC entity 16;
- (2) a middle red arrow identifying the bidirectional path between transport protocol stack 15 and QoS requestor manager 12/QoS protocol machine 13; and

- (3) an upper red arrow identifying the bidirectional path between QoS requestor manager 12/QoS protocol machine 13 and application 11.

See Reply 20; Ex. 1043 ¶ 90.

According to Petitioner, an ordinarily skilled artisan would have understood that “sending a reply to ‘source station 10’ is responding with availability of the connection to the communication manager (QoS requestor manager 12) as claimed.” Reply 20 (citing Ex. 1043 ¶ 90).

(ii) Patent Owner’s Contentions

Patent Owner disputes that the combined disclosures in Goossens2003 and Drake teach limitation 10.d. *See* Resp. 42–45, 63; Sur-reply 23–24. In particular, Patent Owner contends that “Drake does not teach that QoS allocator 20 (alleged ‘resource manager’) sends the QoS allocation reply (alleged ‘respon[se]’) to QoS requestor manager 12 (alleged ‘communication manager’).” Resp. 43, 63 (alteration by Patent Owner) (citing Ex. 2070 ¶ 225).

Patent Owner contends that Drake teaches that:

- (1) “QoS allocator 20 sends the QoS allocation reply to source station 10”; and
- (2) QoS requestor manager 12 “assembles/formats the QoS request,” not that QoS requestor manager 12 “receives any response.”

Resp. 43 (citing Ex. 1006, 4:32–37, 4:54–57, 4:62–65, 8:20–29, 9:52–10:2, 11:22–48, 14:22–27; Ex. 2070 ¶ 226; Ex. 2078, 153:11–18); *see id.* at 44–45 (citing Ex. 1006, 4:55–57, 8:20–29; Ex. 2070 ¶ 228; Ex. 2078, 153:17–18).

Further, Patent Owner asserts that Petitioner fails to establish the obviousness of limitation 10.d over Drake because Petitioner fails to identify evidence that Drake’s QoS allocator 20 sends the QoS allocation reply to

QoS requestor manager 12. Resp. 63. According to Patent Owner, Petitioner does not make “any argument or showing” that Drake renders obvious QoS allocator 20 sending the QoS allocation reply to QoS requestor manager 12. *Id.* (citing Pet. 42–43, 66; Ex. 1003 ¶ 133).

Patent Owner contends that Petitioner’s assertion in the Reply that Drake’s Figure 1 “only shows one path” through the components in source station 10 for the reply from QoS allocator 20 to reach application 11 is an “improper new argument.” Sur-reply 23.

Additionally, Patent Owner contends that Drake’s Figure 1 shows a “path” where QoS allocator 20 sends the QoS allocation reply “through” QoS requestor manager 12 “en route to” application 11. Sur-reply 24 (emphases omitted). According to Patent Owner, “if the QoS allocation reply is sent to application 11 via the path shown by Drake’s Figure 1,” that would not constitute QoS allocator 20 “responding . . . to the communication manager,” i.e., “responding . . . to” QoS requestor manager 12, as required by limitation 10.d. *Id.* (citing Resp. 44, 63). Patent Owner also contends that Petitioner conflates “merely sending” the QoS allocation reply “through” QoS requestor manager 12 with “responding . . . to” QoS requestor manager 12 as required by limitation 10.d. *Id.* (emphasis omitted).

(iii) Analysis

For the reasons explained below, we agree with Petitioner that the combined disclosures in Goossens2003 and Drake teach limitation 10.d. *See* Pet. 42–43, 66, 69; Reply 19–21; Ex. 1003 ¶¶ 67, 91, 133, 197, 208; Ex. 1043 ¶¶ 89–93.

First, Drake discloses that QoS allocator 20 receives a QoS request and then “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, code (57); Ex. 1003 ¶¶ 67, 91, 133. “If the QoS exists, it is assigned to this QoS data stream,” and QoS allocator 20 sends a QoS allocation reply to source station 10. Ex. 1003 ¶ 133; Ex. 1006, 2:40–41, 4:54–55, 8:20–25, 8:50–59, 11:22–26, code (57), Fig. 5 (step 96); Ex. 1043 ¶¶ 90, 92–93. “If the QoS is not available, station 10 is notified of the lack of an adequate QoS path to the intended destination” by an allocation denial message. Ex. 1006, 4:55–57, 11:30–33, 11:36–38, Fig. 5 (step 92); *see id.* at 2:18–21, 2:41, code (57); Ex. 1003 ¶ 133.

Second, Drake explains that application 11 in source station 10 is “responsible for causing the transmission of the multimedia data stream” through LAN 17 to target station 29. Ex. 1006, 4:30–32; *see id.* at 4:58–60. An ordinarily skilled artisan would have understood that “the only way Drake’s QoS [system] works is for the reply regarding the QoS request to get back to application 11,” i.e., the entity that (1) “originally made the QoS request” and (2) subsequently “sends a multimedia file over the established link.” Ex. 1043 ¶¶ 90, 93; *see* Ex. 1006, 4:30–32, 4:58–60.

Third, as Petitioner asserts, Drake’s Figure 1 “only shows one path” through the components in source station 10 for the reply from QoS allocator 20 to reach application 11, i.e., the path through QoS requestor manager 12. *See* Ex. 1006, 3:36–40, Fig. 1; Ex. 1043 ¶¶ 90–92; Reply 19–20. The reply from QoS allocator 20 “goes back to” QoS requestor manager 12 “before anything goes back to” application 11. Ex. 1043 ¶ 92.

Fourth, we disagree with Patent Owner that Petitioner’s assertion in the Reply that Drake’s Figure 1 “only shows one path” through the

components in source station 10 for the reply from QoS allocator 20 to reach application 11 is an “improper new argument.” *See* Sur-reply 23. That assertion in the Reply properly responds to Patent Owner’s contentions in the Response that Drake does not teach “the resource manager responding . . . to the communication manager” according to limitation 10.d and instead teaches that:

- (1) “QoS allocator 20 sends the QoS allocation reply to source station 10”; and
- (2) QoS requestor manager 12 “assembles/formats the QoS request,” not that QoS requestor manager 12 “receives any response.”

See Resp. 43; Reply 19–20; *Rembrandt*, 76 F.4th at 1384–85; *Andrea Elecs.*, 949 F.3d at 706–07; 37 C.F.R. § 42.23(b).

Fifth, Drake discloses that QoS requestor manager 12 “interacts with application 11 using internal messages as is well known in the art.” Ex. 1006, 4:62–64; *see* Ex. 1003 ¶ 130. An ordinarily skilled artisan would have understood that QoS requestor manager 12 “interfaces” with application 11 for “messages going in both directions.” Ex. 1043 ¶ 92; *see id.* ¶ 90; Ex. 1006, 3:21–28, 4:62–64, 8:20–29. Hence, contrary to Patent Owner’s contention, QoS allocator 20 does not send the QoS allocation reply “through” QoS requestor manager 12 “en route to” application 11. *See* Sur-reply 24. Instead, QoS allocator 20 sends the QoS allocation reply to QoS requestor manager 12, and then QoS requestor manager 12 “interacts with application 11 using internal messages.” *See* Ex. 1006, 4:62–64; Ex. 1043 ¶¶ 89–90, 92.

For the reasons discussed above, the combined disclosures in Goossens2003 and Drake teach limitation 10.d, and Patent Owner’s contentions to the contrary lack merit.

(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).

(i) Petitioner’s Contentions

Petitioner contends that the combined disclosures in Goossens2003 and Drake teach limitation 10.e. *See* Pet. 43–44, 67, 70; Reply 21. 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.’” Pet. 67 (quoting Ex. 1007, 67). Petitioner explains that “Goossens2003 provides the first and second modules that the connection is established between.” Reply 21; *see id.* at 4, 16–17.

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. 43–44, 67 (citing Ex. 1006, 10:9–11, 11:17–19, 11:26–28, code (57), Fig. 5). According to Petitioner, a “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.* at 44 (citing Ex. 1006, 8:50–64).

Further, Petitioner asserts that Drake’s QoS allocation database 25 is “updated to reflect the resources that have been reserved for the newly established connection” and are “unavailable for future connection allocations.” Pet. 44 (citing Ex. 1006, 11:11–17, Fig. 5).

(ii) Patent Owner’s Contentions

Patent Owner disputes that the combined disclosures in Goossens2003 and Drake teach limitation 10.e. *See* Resp. 58–60, 63–64; Sur-reply 24–25. In particular, Patent Owner contends that “to the extent that Petitioner relies on Drake’s application 11 as the claimed ‘first module,’ Petitioner failed to argue, let alone meet its burden to show, that a ‘connection between’ application 11 and Drake’s target station 29 (alleged ‘second module’) ‘[is] established.’” Resp. 63–64 (alteration by Patent Owner) (citing Pet. 43–44, 67, 70; Ex. 1003 ¶¶ 134, 198; Ex. 2070 ¶ 297; Ex. 2078, 62:3–7, 171:21–172:4); *see* Sur-reply 24.

Patent Owner contends that Petitioner’s explanation in the Reply that “Goossens2003 provides the first and second modules that the connection is established between” contradicts the Petition’s “clear reliance” on Drake for limitation 10.e. Sur-reply 24–25 (citing Pet. 43–44, 47, 67, 70). Patent Owner contends that Petitioner’s explanation in the Reply that “Goossens2003 provides the first and second modules that the connection is established between” also contradicts Petitioner’s contention in the Reply that in “the combination” a service request would go from Goossens2003’s IP through Drake’s QoS requestor manager 12 based on Drake’s “data path.” *Id.* at 25 (citing Reply 11, 21).

(iii) Analysis

For the reasons explained below, we agree with Petitioner that the combined disclosures in Goossens2003 and Drake teach limitation 10.e. *See* Pet. 43–44, 67, 70; Reply 21; Ex. 1003 ¶¶ 67, 70, 91, 114–115, 133–134, 159, 163, 182, 185, 193, 198–199, 209; Ex. 1043 ¶¶ 90, 92–93.

First, Goossens2003 discloses that IPs “negotiate with network interfaces to obtain connections with certain properties” and reserve network resources. Ex. 1007, 71, 77; *see* Ex. 1003 ¶¶ 185, 193, 199. The NoC “either accepts or rejects the request for the connection.” Ex. 1007, 71; *see* Ex. 1003 ¶ 70. The NoC “will honour the request if [the NoC] has sufficient resources available, and will reject it otherwise.” Ex. 1007, 67; *see* Ex. 1003 ¶¶ 159, 163, 182, 198.

Second, Drake discloses that QoS allocator 20 “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, code (57); Ex. 1003 ¶¶ 67, 91, 133. For instance, “the stored component parameters are consulted to determine if the components in the selected path, individually and together, satisfy the requested QoS values for a multimedia transmission.” Ex. 1006, 2:37–40.

“If the QoS exists, it is assigned to this QoS data stream,” and QoS allocator 20 sends a QoS allocation reply to source station 10. Ex. 1003 ¶ 133; Ex. 1006, 2:40–41, 4:54–55, 8:20–25, 8:50–59, 11:22–26, code (57), Fig. 5 (step 96); Ex. 1043 ¶¶ 90, 92–93. A QoS allocation reply includes, among other things, a “StreamID” identifying “a particular QoS allocation reserved for a data stream,” “Route Designator Fields” identifying “the network components used to determine if the QoS requested can be satisfied

for a particular allocation,” and the “QoS parameters of the path granted to [a] data stream, if granted.” Ex. 1006, 8:50–62; *see* Ex. 1003 ¶ 134.

Drake also discloses that QoS allocator 20 relies on data in QoS allocation database 25 when “carrying out its management functions.” Ex. 1006, 5:5–9; *see id.* at code (57); Ex. 1003 ¶¶ 114–115. 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 3:14–20, 3:41–43, 6:29–8:19, code (57), Fig. 2; Ex. 1003 ¶ 115. Further, as Petitioner asserts, QoS allocation database 25 is “updated to reflect the resources that have been reserved for the newly established connection” and are “unavailable for future connection allocations.” *See* Ex. 1003 ¶ 134; Ex. 1006, 10:60–11:48, 12:11–16, Fig. 5; Pet. 44.

Hence, the combined disclosures in Goossens2003 and Drake teach establishing a “target connection between the first and second module” based on “the available properties of said communication channels of said connection” according to limitation 10.e. *See* Ex. 1003 ¶¶ 67, 70, 91, 115, 133–134, 159, 163, 182, 185, 193, 198–199, 209; Ex. 1006, 2:18–21, 2:32–41, 3:14–20, 4:50–55, 5:5–14, 8:50–62, code (57); Ex. 1007, 67, 71, 77.

Third, we disagree with Patent Owner that Petitioner’s explanation in the Reply that “Goossens2003 provides the first and second modules that the connection is established between” contradicts the Petition’s “clear reliance” on Drake for limitation 10.e. *See* Sur-reply 24–25. The Petition relies on both Goossens2003 and Drake for limitation 10.e. Pet. 43–44, 67, 70; *see*

Ex. 1003 ¶¶ 134, 198, 209. So Petitioner’s explanation in the Reply that “Goossens2003 provides the first and second modules that the connection is established between” does not contradict:

- (1) Petitioner’s contentions in the Petition; or
- (2) Petitioner’s reliance on Drake to teach establishing a “target connection” based on “the available properties of said communication channels of said connection” according to limitation 10.e.

See Pet. 43–44, 67, 70; Reply 21.

Fourth, we disagree with Patent Owner that Petitioner’s explanation in the Reply that “Goossens2003 provides the first and second modules that the connection is established between” contradicts Petitioner’s contention in the Reply that in “the combination” a service request would go from Goossens2003’s IP through Drake’s QoS requestor manager 12 based on Drake’s “data path.” *See* Sur-reply 25. Petitioner explains in the Reply that application 11 is “the thing specifically making the service request.” Reply 3 (citing Pet. 27, 40–41, 59, 65–66; Ex. 1003 ¶¶ 129–131, 177, 195; Ex. 1043 ¶¶ 12–15). As “the thing specifically making the service request,” application 11 corresponds to Goossens2003’s IP making a service request to a network interface. *See* Ex. 1043 ¶¶ 14, 75; Ex. 2078, 174:23–176:3; Ex. 2088, 175:4–16, 179:8–180:15, 183:2–14, 184:10–12.

In Drake, a service request goes from application 11 (the entity making the request) through QoS requestor manager 12 and the other components in source station 10 before reaching QoS allocator 20. *See* Ex. 1006, 3:36–40, 4:30–40, 4:50–54, Fig. 1; Ex. 1043 ¶¶ 14–15, 75, 83; *supra* § III.E.4(c)(iii). The proposed combination includes QoS requestor manager 12 and QoS allocator 20 implemented in Goossens2003’s SoC. *See*

supra §§ III.E.3(e)(i).a, III.E.3(e)(i).d–e. Hence, in the proposed combination, a service request would go from Goossens2003’s IP (the entity making the request) through QoS requestor manager 12 before reaching QoS allocator 20. *See* Ex. 1043 ¶ 45.

As Dr. Mowry explains about the proposed combination, QoS allocator 20 would “work in the same way as it is described in Drake.” Ex. 1043 ¶ 45. In particular, QoS allocator 20 would “receive the QoS request from the requesting entity/application (forwarded by the QoS requestor manager 12), examine the resources of the network to determine whether it can be satisfied, and send a reply back through the QoS requestor manager 12 which indicates whether the requested QoS is available.” *Id.* (emphasis omitted). We credit Dr. Mowry’s testimony.

For the reasons discussed above, the combined disclosures in Goossens2003 and Drake teach limitation 10.e, and Patent Owner’s contentions to the contrary lack merit.

(g) Alleged Failure to Specify Where the Claimed
“First Module” Is Found in the Prior Art

The Board’s rules require that a petition “specify where each element of the claim is found in the prior art patents or printed publications relied upon.” 37 C.F.R. § 42.104(b)(4).

(i) Patent Owner’s Position

Patent Owner argues that the Petition fails to satisfy § 42.104(b)(4) because the Petition takes “inconsistent positions” and does not “clearly specify” where the claimed “first module” is found in Drake. *See* Resp. 17–20. Specifically, Patent Owner asserts that the Petition sometimes maps the claimed “first module” to Drake’s source station 10 and sometimes maps

the claimed “first module” to only application 11 in Drake’s source station 10. *Id.* at 17–18.

Patent Owner further asserts that Dr. Mowry “initially testified that Drake’s source station 10 corresponds to the claimed ‘first module’” but “later clarified that only the application 11 within source station 10 corresponds to the claimed ‘first module.’” Resp. 18–19 (emphasis omitted) (citing Ex. 2078, 173:8–13, 174:10–19, 174:23–175:19, 175:21–176:2).

(ii) Petitioner’s Position

Petitioner contends that Patent Owner’s argument that the Petition fails to satisfy § 42.104(b)(4) is “both incorrect and irrelevant.” Reply 3. Petitioner explains that the Petition and Dr. Mowry rely on Goossens2003 for disclosing the claimed “first module.” *Id.* at 4, 16–17, 21 (citing Pet. 55, 59, 62–63, 65–67). According to Petitioner, Patent Owner “does not dispute” that Goossens2003 discloses the claimed “first module.” *Id.* at 4, 17, 21 (emphasis omitted).

As for Drake, Petitioner explains that application 11 in Drake’s source station 10 is “the thing specifically making the service request.” Reply 3 (citing Pet. 27, 40–41, 59, 65–66; Ex. 1003 ¶¶ 129–131, 177, 195; Ex. 1043 ¶¶ 12–15). According to Petitioner, Dr. Mowry “confirmed at his deposition that he was focusing on” application 11 as “the component Drake teaches makes the service request.” *Id.* at 3–4 (citing Ex. 1006, 4:27–29; Ex. 2078, 171:21–176:3).

(iii) Analysis

Patent Owner’s argument that the Petition fails to satisfy § 42.104(b)(4) because the Petition takes “inconsistent positions” and does not “clearly specify” where the claimed “first module” is found in Drake

lacks merit. *See* Resp. 17–20. The Petition relies on Goossens2003 for disclosing the claimed “first module” and the claimed “second module.” Pet. 55, 59, 65; *see* Reply 4, 16–17, 21; Paper 64, 16–17; Ex. 1003 ¶¶ 170, 176, 193–194; Ex. 1043 ¶¶ 13, 74; *supra* §§ III.E.4(a)(i), III.E.4(b)(i). For example, the Petition includes the following highlighted version of Goossens2003’s Figure 4.5 showing multiple processing “modules” in Goossens2003’s SoC (Pet. 55):

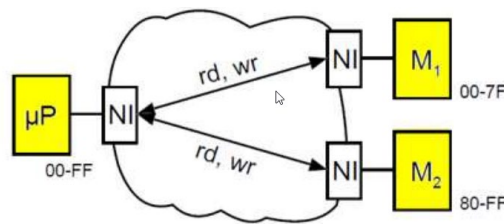


Figure 4.5. A narrowcast connection.

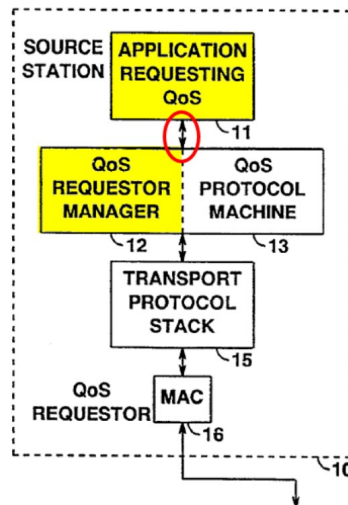
Figure 4.5 illustrates an example narrowcast connection between a master IP module identified as “μP” (microprocessor) and two slave IP modules identified as “M₁” (memory module 1) and “M₂” (memory module 2) together with a network interface (NI) associated with each of the three processing “modules.” Ex. 1007, 72; *see* Ex. 1003 ¶ 170. The above highlighted version of Figure 4.5 includes yellow highlighting over each of the three processing “modules.” *See* Pet. 55; Ex. 1003 ¶ 170.

Specifically, the Petition maps the claimed “first module” to a master IP module in Goossens2003’s SoC, e.g., the “μP” module. Pet. 59, 65; *see* Reply 4, 17; Paper 64, 16; Ex. 1003 ¶¶ 176, 193–194; Ex. 1043 ¶¶ 13, 74; *supra* §§ III.E.4(a)(i), III.E.4(b)(i). Similarly, the Petition maps the claimed “second module” to a slave IP module in Goossens2003’s SoC, e.g., the “M₁” module or the “M₂” module. Pet. 59, 65; *see* Paper 64, 16; Ex. 1003 ¶¶ 176, 194; *supra* §§ III.E.4(a)(i), III.E.4(b)(i).

Thus, the Petition specifies where the disputed claim element is “found in the prior art patents or printed publications relied upon” according to the Board’s rules. *See* Pet. 55, 59, 65; Ex. 1003 ¶¶ 170, 176, 193–194; 37 C.F.R. § 42.104(b)(4).

Insofar as the Petition also references Drake for the claimed “first module,” Petitioner explains that application 11 in Drake’s source station 10 is “the thing specifically making the service request.” Reply 3; *see* Pet. 59, 65–66 (discussing Drake); Ex. 1003 ¶¶ 177, 195 (discussing Drake). As “the thing specifically making the service request,” application 11 corresponds to Goossens2003’s IP making a service request to a network interface. *See* Ex. 1043 ¶¶ 14, 75; Ex. 2078, 174:23–176:3; Ex. 2088, 175:4–16, 179:8–180:15, 183:2–14, 184:10–12.

Consistent with Petitioner’s explanation, the Petition includes the following annotated and highlighted excerpt from Drake’s Figure 1 showing how the claimed “first module” communicates with the claimed “communication manager” (Pet. 41):



The above annotated and highlighted excerpt from Drake’s Figure 1 illustrates source station 10 with yellow highlighting over application 11,

yellow highlighting over QoS requestor manager 12, and a red oval around the bidirectional path between application 11 and QoS requestor manager 12/QoS protocol machine 13. *See* Pet. 41; Ex. 1003 ¶ 130.

Patent Owner acknowledges that Dr. Mowry “clarified” at his first deposition that “only the application 11 within source station 10 corresponds to the claimed ‘first module.’” *See* Resp. 18–19 (emphasis omitted) (citing Ex. 2078, 173:8–13, 174:10–19, 174:23–175:19, 175:21–176:2).

Hence, Petitioner explains sufficiently how the combined disclosures in Goossens2003 and Drake relate to the claimed “first module.” *See* Pet. 55, 59, 65–66; Reply 3–4, 16–17, 21; Ex. 1003 ¶¶ 170, 176–177, 193–195; Ex. 1043 ¶¶ 13–15, 74–75; Ex. 2078, 174:23–176:3; Ex. 2088, 175:4–16, 179:8–180:15, 183:2–14, 184:10–12.

When instituting an *inter partes* review in IPR2024-01081, the Board preliminarily determined that Petitioner “consistently identifies Drake’s source station 10 as the claimed ‘first module.’” Qualcomm Inst. Dec. 23 (citing Pet. 27, 32, 40–41, 59); IPR2024-01081, Paper 14 at 23. In making that preliminary determination in IPR2024-01081, however, the Board did not consider the following explanation by Samsung in the Preliminary Reply in this proceeding: “The Petition identifies a separate ‘first module’ of Drake (application within source station) from the ‘communication manager’ (QoS requestor manager).” Prelim. Reply 7 n.5 (citing Samsung Pet. 38). As discussed above, Qualcomm’s petition in IPR2024-01081 includes substantively identical grounds to those asserted in Samsung’s Petition. *See* Samsung Pet. 9, 15–68; Pet. 10, 16–71; *supra* § II.A.

Further, when given an opportunity in the Reply to respond to that preliminary determination in IPR2024-01081, Petitioner explained that

application 11 in Drake’s source station 10 is “the thing specifically making the service request.” Reply 3; *see* Paper 64, 19. The Board’s rules specify that a petitioner reply may respond to a “decision on institution.” 37 C.F.R. § 42.23(b).

(h) Conclusion Concerning Obviousness/Nonobviousness for Claim 10

For the reasons discussed above, the combined disclosures in Goossens2003 and Drake teach claim 10’s subject matter. *See supra* §§ III.E.4(a)–(f). Moreover, an ordinarily skilled artisan would have been motivated to combine Drake’s QoS teachings with Goossens2003’s teachings in the way Petitioner proposes and would have had a reasonable expectation of success. *See supra* § III.E.3(e). Hence, Petitioner has shown by a preponderance of the evidence that claim 10 is unpatentable under § 103(a) because the claim would have been obvious over Goossens2003 and Drake.

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

(a) Claim 2

Claim 2 depends directly from claim 1 and further requires “at least one communication manager (CM) for managing the communication between different modules.” Ex. 1001, 18:49–51.

Petitioner contends that the combined disclosures in Goossens2003 and Drake teach a “communication manager” according to claim 2 for the reasons Petitioner contends that the combined disclosures teach a “communication manager” according to limitation 10.a. *See, e.g.*, Pet. 35–36, 40–41, 62–63, 65–67, 69; Reply 16.

Patent Owner disputes that the combined disclosures in Goossens2003 and Drake teach a “communication manager” according to claim 2 for the

reasons Patent Owner disputes that the combined disclosures teach a “communication manager” according to limitation 10.a. *See, e.g.*, Resp. 47–62; Sur-reply 20–21.

For the reasons discussed above for limitation 10.a, we agree with Petitioner that the combined disclosures in Goossens2003 and Drake teach a “communication manager” according to claim 2. *See supra* § III.E.4(b)(iii).

(b) Claim 6

Claim 6 reads as follows (with formatting added for clarity and with bracketed numbers and letters added for reference purposes):³¹

6. [6.pre] Integrated circuit according to claim 2,

[6.a] wherein said first module (M; I) is adapted to issue a request (REQ) for a connection with at least one of said second modules to said communication manager (CM),

[6.b] said communication manager (CM) is adapted to forward said request (REQ) for a connection with communication channels each having a specific set of connection properties to said resource manager (RM),

[6.c] said resource manager (RM) responding with the availability of the requested connection to said communication manager (CM),

[6.d] wherein a connection between the first and second module [sic] is established based on the available properties of said communication channels of said connection.

Ex. 1001, 18:60–19:5.

Petitioner contends that the combined disclosures in Goossens2003 and Drake teach limitations 6.a, 6.b, 6.c, and 6.d for the reasons Petitioner contends that the combined disclosures teach limitations 10.a, 10.b, 10.d,

³¹ We use the same reference numbers and letters that Petitioner uses to identify the claim language. *See* Pet. 39–44.

and 10.e. *See, e.g.*, Pet. 24–25, 35–36, 40–44, 57, 60, 62–63, 65–67, 69–70; Reply 16–21.

Patent Owner disputes that the combined disclosures in Goossens2003 and Drake teach limitations 6.a, 6.b, 6.c, and 6.d for the reasons Patent Owner disputes that the combined disclosures teach limitations 10.a, 10.b, 10.d, and 10.e. *See, e.g.*, Resp. 41–64; Sur-reply 20–25. Further, Patent Owner asserts that Petitioner fails to explain “why or how” an ordinarily skilled artisan would have combined Drake’s QoS teachings with Goossens2003’s teachings to yield claim 6’s subject matter. *See* Resp. 56–60; Sur-reply 18–20.

For the reasons discussed above for limitations 10.a, 10.b, 10.d, and 10.e, we agree with Petitioner that the combined disclosures in Goossens2003 and Drake teach limitations 6.a, 6.b, 6.c, and 6.d. *See supra* §§ III.E.4(b)(iii), III.E.4(c)(iii), III.E.4(e)(iii), III.E.4(f)(iii). Further, the analysis above about motivation to combine addresses Patent Owner’s assertion regarding Petitioner’s alleged failure to explain “why or how” an ordinarily skilled artisan would have combined Drake’s QoS teachings with Goossens2003’s teachings to yield claim 6’s subject matter. *See* Resp. 56–60; *supra* § III.E.3(e)(i).

(c) Claim 9

Claim 9 depends directly from claim 2 and further requires “at least one network interface means (NI), associated to each of said modules, for managing the communication between said modules and said network (N).” Ex. 1001, 19:17–20.

(i) Petitioner's Contentions

Petitioner contends that Goossens2003 teaches claim 9's limitation because Goossens2003 discloses that:

- (1) the SoC includes network interfaces (NIs) positioned between the IPs and the NoC; and
- (2) the network interfaces “translate between the ‘transport layer’ utilized by the IPs to request services and the ‘network layer’ utilized by” the NoC's routers to transport data.

Pet. 67–68 (citing Ex. 1003 ¶ 199; Ex. 1007, 72, 74–77).

To support its contentions, Petitioner provides a highlighted version of Goossens2003's Figure 4.5 as reproduced below (Pet. 68):

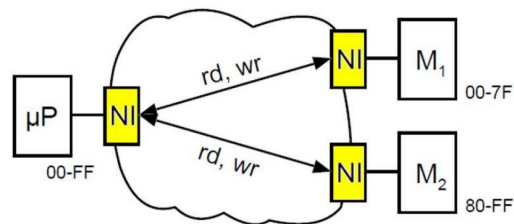


Figure 4.5. A narrowcast connection.

Figure 4.5 illustrates an example narrowcast connection between a master IP module identified as “μP” (microprocessor) and two slave IP modules identified as “M₁” (memory module 1) and “M₂” (memory module 2) together with a network interface (NI) associated with each of the three processing modules. Ex. 1007, 72; *see* Ex. 1003 ¶ 170. The above highlighted version of Figure 4.5 includes yellow highlighting over each of the three network interfaces. *See* Pet. 68; Ex. 1003 ¶ 200.

Further, Petitioner asserts that an ordinarily skilled artisan “would have understood that these network interfaces manage the communications

between the IPs (i.e., modules) and the NOC (i.e., network).” Pet. 67 (emphases omitted) (citing Ex. 1003 ¶¶ 199–200).

(ii) Patent Owner’s Contentions

Regarding Petitioner’s assertion that Goossens2003’s network interface includes the claimed “communication manager,” Patent Owner contends that (a) the claimed “communication manager” and the claimed “network interface means” are “separate elements” and (b) Petitioner makes “no attempt” to explain how the “same element” can act as both the claimed “communication manager” and the claimed “network interface means.” Resp. 61 (citing Pet. 62–63).

(iii) Analysis

We agree with Petitioner that Goossens2003 teaches claim 9’s limitation. *See* Pet. 67–68; Ex. 1003 ¶¶ 199–200. Specifically, Goossens2003 discloses that (1) services are offered to IPs at “the transport layer and are end to end (master to slave and vice versa)” and (2) network interfaces (a) “bridge the network layer and transport layer” and (b) convert “network layer services of the routers to transport layer services for the user.” Ex. 1007, 74, 76; *see* Ex. 1003 ¶ 199. In particular, the network interfaces “translate between the ‘transport layer’ utilized by the IPs to request services and the ‘network layer’ utilized by” the NoC’s routers to transport data. *See* Ex. 1003 ¶ 199; Ex. 1007, 74, 76–77. By translating between the transport layer and the network layer, part of a network interface “manag[es] the communication between said modules and said network” according to claim 9. *See* Ex. 1003 ¶ 199.

As discussed above in a preceding section, Goossens2003 discloses that part of a network interface manages the communication between

different modules and corresponds to the claimed “communication manager,” e.g., because the IPs “negotiate with network interfaces to obtain connections with certain properties,” including “reordering, transaction completion, and flow control.” *See* Ex. 1003 ¶¶ 185–186, 193, 199; Ex. 1007, 74, 76–77; Ex. 1043 ¶¶ 19, 29, 76; *supra* § III.E.4(b)(iii). As discussed above in this section, Goossens2003 discloses that part of a network interface “manag[es] the communication between said modules and said network” according to claim 9. *See* Ex. 1003 ¶ 199; Ex. 1007, 74, 76–77. The claims do not preclude different parts of a network interface from performing these different functions. *See* Ex. 1001, 18:32–51, 19:17–20. Moreover, Patent Owner admits that the ’449 patent describes “the ‘communication manager’ as being arranged in a ‘network,’ a ‘router network,’ or a ‘network interface means.’” Ex. 1020, 19; *see* Resp. 14 (citing Ex. 1001, 10:3–6).

Further, for the reasons discussed in the analysis above about motivation to combine, we agree with Petitioner that an ordinarily skilled artisan would have implemented Drake’s QoS requestor manager 12 (mapped to the claimed “communication manager”) in a network interface in Goossens2003’s NoC. *See* Reply 12; Ex. 1003 ¶¶ 185–186; Ex. 1007, 74, 76–77; Ex. 1043 ¶¶ 19, 29, 38, 48, 55, 61, 156; Ex. 2078, 203:24–204:8; Ex. 2088, 95:14–96:1; *supra* § III.E.3(e)(i).d. With Drake’s QoS requestor manager 12 implemented in Goossens2003’s network interface, the claimed “communication manager” taught by Drake and the claimed “network interface means” taught by Goossens2003 would be “separate elements.”

For these reasons, Patent Owner’s contention that the claimed “communication manager” and the claimed “network interface means” are “separate elements” does not undermine Petitioner’s position. *See* Resp. 61.

(d) Claim 11

Claim 11 depends directly from claim 10 and specifies that “the network manages traffic utilizing at least one of a switch and a router.”

Ex. 1001, 20:8–9.

Petitioner contends that Goossens2003 teaches claim 11’s limitation because Goossens2003 discloses that:

- (1) the NoC contains routers that transport data; and
- (2) the NoC uses “a switch to control whether ‘guaranteed (GT)’ or ‘best-effort (BE)’ packets have access to the data path.”

Pet. 56–57, 63–64, 70 (citing Ex. 1007, 74–76).

To support its contentions, Petitioner provides an annotated and highlighted version of Goossens2003’s Figure 4.7 as reproduced below (Pet. 64):

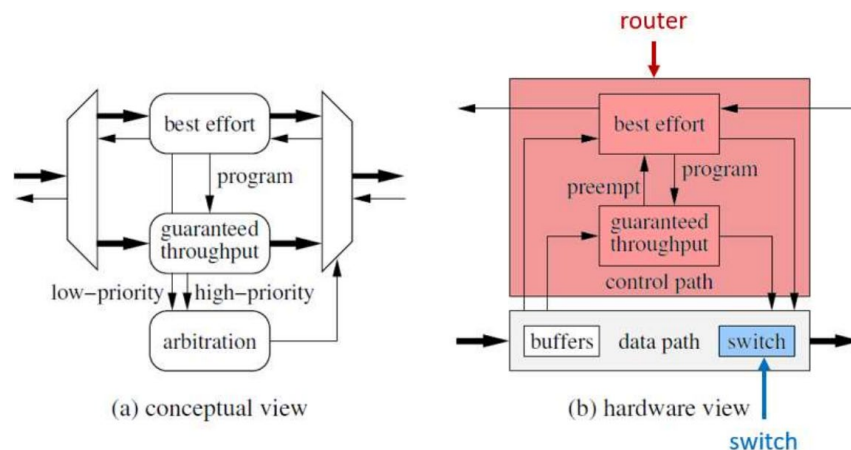


Figure 4.7. Two views of the combined GT-BE router.

Figure 4.7 illustrates two views of a combined GT-BE router, with the view on the left labeled “(a) conceptual view” and the view on the right labeled “(b) hardware view.” Ex. 1007, 76. The above annotated and highlighted version of Figure 4.7 includes in the view on the right (1) blue highlighting over the “switch” block in the data path, (2) the blue annotation “switch” identifying the “switch” block, (3) red highlighting over the component containing the “guaranteed throughput” block and the “best effort” block, and (4) the red annotation “router” identifying that component. *See* Pet. 64; Ex. 1003 ¶ 189.

Patent Owner makes no arguments specific to claim 11. *See, e.g.*, Resp. 6–8, 17–20, 45–64; Sur-reply 2–26.

For the reasons stated by Petitioner and supported by Dr. Mowry’s testimony, we agree with Petitioner that Goossens2003 teaches claim 11’s limitation. *See* Pet. 56–57, 63–64, 70; Ex. 1003 ¶¶ 171–172, 188–189, 210.

(e) Claim 12

Claim 12 depends directly from claim 10 and specifies that “the processing modules and the network are disposed on a chip.” Ex. 1001, 20:10–11.

Petitioner contends that Goossens2003 teaches claim 12’s limitation because Goossens2003 discloses an SoC including multiple IPs and an NoC that provides “connections” between various IPs. Pet. 58–59, 64, 70. Petitioner also contends that an ordinarily skilled artisan “would have understood that these components are on the same chip.” *Id.* at 58.

Patent Owner makes no arguments specific to claim 12. *See, e.g.*, Resp. 6–8, 17–20, 45–64; Sur-reply 2–26.

For the reasons stated by Petitioner and supported by Dr. Mowry's testimony, we agree with Petitioner that Goossens2003 teaches claim 12's limitation. *See* Pet. 58–59, 64, 70; Ex. 1003 ¶¶ 174, 176, 190, 211.

(f) Claims 13 and 16

Claim 13 depends directly from claim 10 and specifies that “the connection properties comprise at least one of data transport ordering, flow control, throughput, latency, and lossiness.” Ex. 1001, 20:12–14. Claim 16 depends directly from claim 10 and specifies that “the connection properties comprise at least one of throughput, latency and jitter.” *Id.* at 20:24–26.

Petitioner contends that Goossens2003 teaches the limitations in claims 13 and 16 because Goossens2003 discloses that “each of its channels has properties that include at least ‘flow control’ and ‘throughput guarantees.’” Pet. 64–65, 70–71 (citing Ex. 1003 ¶ 191; Ex. 1007, 72–74); *see id.* at 60 (citing Ex. 1003 ¶ 178; Ex. 1007, 72–74). As support, Petitioner quotes Goossens2003's disclosures about “using end-to-end flow control to constrain the sender to never send more than the available space” and providing “bounds on connection throughput, latency, and jitter.” *Id.* at 64, 70 (quoting Ex. 1007, 69, 74).

Patent Owner makes no arguments specific to claims 13 and 16. *See, e.g.,* Resp. 6–8, 17–20, 45–64; Sur-reply 2–26.

For the reasons stated by Petitioner and supported by Dr. Mowry's testimony, we agree with Petitioner that Goossens2003 teaches the limitations in claims 13 and 16. *See* Pet. 64–65, 70–71; Ex. 1003 ¶¶ 191, 212, 216.

(g) Claim 14

Claim 14 depends directly from claim 10 and further requires “the resource manager determining whether the target connection with the desired connection properties is available based on reading of a centralized or distributed property table comprising properties associated with the network.” Ex. 1001, 20:15–19.

Petitioner contends that the combined disclosures in Goossens2003 and Drake teach claim 14’s limitation. *See* Pet. 34, 48–49, 70–71. Specifically, Petitioner asserts that Drake’s QoS allocator 20 (mapped to the claimed “resource manager”) “determine[s] if the QoS is available in the components in the multimedia transmission path” using a QoS database. *Id.* at 34 (alteration by Petitioner) (quoting Ex. 1006, 10:47–49); *see id.* at 49, 70–71. According to Petitioner, the QoS database contains “information regarding the components of the network and the resources reserved by previously allocated connections.” *Id.* at 34 (citing Ex. 1006, 5:8–14, 10:60–11:48); *see id.* at 49, 70–71. Petitioner also asserts that QoS allocator 20 queries the QoS database to “determine whether requested connection properties, such as ‘bandwidth’ (i.e., throughput) and/or ‘maximum delay’ (i.e., latency), are available, and if so, the requested connection is established and the required resources are reserved.” *Id.* at 49 (emphases omitted) (citing Ex. 1006, 10:63–11:7, code (57)).

Additionally, Petitioner contends that Drake’s QoS database corresponds to a “centralized . . . property table” according to claim 14. Pet. 49, 70–71.

Patent Owner makes no arguments specific to claim 14. *See, e.g.*, Resp. 6–8, 17–20, 45–64; Sur-reply 2–26.

For the reasons stated by Petitioner and supported by Dr. Mowry's testimony, we agree with Petitioner that the combined disclosures in Goossens2003 and Drake teach claim 14's limitation. *See* Pet. 34, 48–49, 70–71; Ex. 1003 ¶¶ 114–116, 150, 213.

(h) Claim 15

Claim 15 depends directly from claim 10 and further requires “the resource manager reserving the target connection after determining whether the target connection with the desired connection properties is available.” Ex. 1001, 20:20–23.

Petitioner contends that Drake teaches claim 15's limitation because Drake discloses that:

- (1) QoS allocator 20 (mapped to the claimed “resource manager”) “determine[s] if the QoS is available in the components in the multimedia transmission path” using a QoS database containing “information regarding the components of the network and the resources reserved by previously allocated connections”; and
- (2) after QoS allocator 20 “determines that a requested connection is available, the QoS allocator reserves the resources required for the requested connection.”

Pet. 34, 50, 71 (citing Ex. 1003 ¶¶ 151–152, 214; Ex. 1006, 4:31–36, 5:8–14, 7:45–8:5, 10:46–49, 10:60–11:48, code (57)).

Patent Owner makes no arguments specific to claim 15. *See, e.g.*, Resp. 6–8, 17–20, 45–64; Sur-reply 2–26.

For the reasons stated by Petitioner and supported by Dr. Mowry's testimony, we agree with Petitioner that Drake teaches claim 15's limitation. Pet. 34, 50, 71; Ex. 1003 ¶¶ 114–115, 152, 214.

(i) Summary for Dependent Claims 2, 6, 9, and 11–16

For the reasons discussed above, the combined disclosures in Goossens2003 and Drake teach the subject matter in claims 2, 6, 9, and 11–16. *See supra* §§ III.E.5(a)–(h). Moreover, an ordinarily skilled artisan would have been motivated to combine Drake’s QoS teachings with Goossens2003’s teachings in the way Petitioner proposes and would have had a reasonable expectation of success. *See supra* § III.E.3(e). Hence, Petitioner has shown by a preponderance of the evidence that claims 2, 6, 9, and 11–16 are unpatentable under § 103(a) because the claims would have been obvious over Goossens2003 and Drake.

*F. Alleged Obviousness over Goossens2002
and Drake: Claims 2, 6, and 9–16*

As noted above, Petitioner contends that claims 2, 6, and 9–16 are unpatentable under § 103(a) because the claims would have been obvious over Goossens2002 and Drake. *See* Pet. 10, 16–50; Reply 3–4, 21–23; *supra* § II.G. Patent Owner disputes Petitioner’s contentions. *See* Resp. 6–8, 17–45; Sur-reply 2–26.

The challenge based on Goossens2003 and Drake resolves the patentability questions for claims 2, 6, and 9–16. *See supra* §§ III.E.4–III.E.5. Hence, we need not reach the challenge based on Goossens2002 and Drake. *See SAS Inst. Inc. v. Iancu*, 584 U.S. 357, 371 (2018) (holding that a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”); *Bos. Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App’x 984, 990 (Fed. Cir. 2020) (agreeing that the Board “need not address issues that are not necessary to the resolution of the proceeding”).

IV. JOINDER AND THE ONE-YEAR TIME BAR IN § 315(b)

Regarding joinder, § 315(c) permits joinder as a party and states:

If the Director institutes an inter partes review, the Director, in his or her discretion, may join as a party to that inter partes review any person who properly files a petition under section 311 that the Director, after receiving a preliminary response under section 313 or the expiration of the time for filing such a response, determines warrants the institution of an inter partes review under section 314.

35 U.S.C. § 315(c).

Regarding timeliness, § 315(b) requires filing a petition for an *inter partes* review no later than “1 year after the date on which the petitioner, real party in interest, or privy of the petitioner is served with a complaint alleging infringement of the patent.” 35 U.S.C. § 315(b). The Board’s rules include the same one-year time bar. 37 C.F.R. § 42.101(b). But § 315(b) also provides that the one-year time bar “shall not apply to a request for joinder” under § 315(c). 35 U.S.C. § 315(b); *see* 37 C.F.R. § 42.122(b).

Patent Owner contends that § 315(b)’s one-year time bar precludes Petitioner from participating in this proceeding because:

- (1) Patent Owner served Petitioner with a complaint alleging infringement of the ’449 patent on December 23, 2022; and
- (2) Petitioner filed the petition in IPR2024-01081 on June 21, 2024, i.e., about 18 months after service of the complaint on Petitioner.

See Resp. 68 (citing 35 U.S.C. § 315(c)); IPR2024-01081, Paper 7 at 1–2, 14–15. Patent Owner renews arguments that it made when opposing Petitioner’s motion for joinder in IPR2024-01081. *See* IPR2024-01081, Paper 7 at 14–15.

Petitioner contends that § 315(b)'s one-year time bar does not preclude it from participating in this proceeding because it timely filed the petition in IPR2024-01081 together with a motion for joinder to this proceeding. *See* Reply 28.

For the reasons explained in the decision granting Petitioner's motion for joinder in IPR2024-01081, we agree with Petitioner that § 315(b)'s one-year time bar does not preclude it from participating in this proceeding. Qualcomm Inst. Dec. 16–17.

V. PETITIONER'S MOTION TO EXCLUDE EVIDENCE

Petitioner moves to exclude the following exhibits submitted by Patent Owner:

Exhibit	Description
2065	IEEE Terms & Disclosures for Use of IEEE Websites
2067	Transcript of the August 27, 2024, Deposition of Dr. Nikil Dutt in IPR2024-00343
2068	2014 Design, Automation and Test in Europe Conference ("DATE") Website Main Page
2073	Thesis Titled "Routing Algorithms for on Chip Networks" Submitted to the Graduate School of Natural and Applied Sciences of Middle East Technical University, by Maksat Atagoziyev, Dated December 2007
2081	IEEE Terms & Disclosures for Use of IEEE Websites
2082	IEEE Xplore Bibliographic Data for a Paper Titled "An Efficient On-Chip Network Interface Offering Guaranteed Services, Shared-Memory Abstraction, and Flexible Network Configuration," by Andrei Rădulescu et al., in Proceedings of the Design, Automation and Test in Europe Conference and Exhibition (DATE'04)

Paper 57, 2–7.

Petitioner also moves to exclude paragraph 81 in Dr. Bagherzadeh's declaration (Exhibit 2070) because that paragraph relies on Exhibit 2073. Paper 57, 3–4.

In our analyses above, we do not rely on any of the evidence that Petitioner seeks to exclude. *See, e.g., supra* §§ III.C–III.E. Hence, we dismiss Petitioner's motion to exclude evidence as moot. *See, e.g., Netflix, Inc. v. GoTV Streaming, LLC*, IPR2023-00757, Paper 39 at 135 (PTAB Nov. 5, 2024) (dismissing motion to exclude evidence as moot); *Volkswagen Grp. of Am., Inc. v. Spero*, IPR2023-00335, Paper 40 at 24 (PTAB July 15, 2024) (dismissing motion to exclude evidence as moot).

VI. CONCLUSION

Based on the evidence presented with the Petition, the evidence introduced during the trial, and the parties' respective arguments, Petitioner has shown by a preponderance of the evidence that claims 2, 6, and 9–16 are unpatentable under § 103(a) because the claims would have been obvious over Goossens2003 and Drake.³²

³² Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding after the issuance of this Final Written Decision, we draw Patent Owner's attention to the April 2019 Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding. *See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. §§ 42.8(a)(3), (b)(2).

In summary:

Claim(s)	35 U.S.C. §	Reference(s)/ Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
1–6, 9–16	103(a)	Goossens2002, Drake ³³		
1–6, 9–16	103(a)	Goossens2003, Drake ³⁴	2, 6, 9–16	
Overall Outcome			2, 6, 9–16	

VII. ORDER

Accordingly, it is

ORDERED that claims 2, 6, and 9–16 in the '449 patent are determined to be unpatentable;

FURTHER ORDERED that Petitioner's motion to exclude evidence (Paper 57) is dismissed as moot; and

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

³³ We do not address the patentability of claims 1 and 3–5 because Patent Owner statutorily disclaimed claims 1 and 3–5. Ex. 2062, 3; *see* Prelim. Resp. 13 n.1, 41 n.4. Also, in view of our determination that claims 2, 6, and 9–16 are unpatentable under § 103(a) because the claims would have been obvious over Goossens2003 and Drake, we do not reach this challenge to claims 2, 6, and 9–16 based on Goossens2002 and Drake. *See supra* § III.F.

³⁴ We do not address the patentability of claims 1 and 3–5 because Patent Owner statutorily disclaimed claims 1 and 3–5. Ex. 2062, 3; *see* Prelim. Resp. 13 n.1, 41 n.4.

IPR2024-00338
Patent 7,373,449 B2

For PETITIONER (original):

J. Derek Vandenburg
CARLSON CASPERS VANDENBURGH & LINDQUIST, P.A.
dvandenburg@carlsoncaspers.com

Greg Arovas
Alan Rabinowitz
F. Mizzo
KIRKLAND & ELLIS LLP
greg.arovas@kirkland.com
alan.rabinowitz@kirkland.com
chris.mizzo@kirkland.com

For PETITIONER (IPR2024-01081 joined):

John Vandenburg
Aaron Pederson
Nathan Louwagie
Ryan Rypka
CARLSON CASPERS VANDENBURGH & LINDQUIST, P.A.
dvandenburg@carlsoncaspers.com
apederson@carlsoncaspers.com
nlouwagie@carlsoncaspers.com
rrypka@carlsoncaspers.com

For PATENT OWNER:

Jennifer Hayes
Daniel S. Stringfield
Angelo J. Christopher
Hang Zheng
NIXON PEABODY LLP
jenhayes@nixonpeabody.com
dstringfield@nixonpeabody.com
achristopher@nixonpeabody.com
hzheng@nixonpeabody.com