

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

QUALCOMM INCORPORATED
Petitioner¹

v.

NETWORK SYSTEM TECHNOLOGIES, LLC
Patent Owner

Case: IPR2024-00338
U.S. Patent No. 7,373,449 B2

PETITIONER QUALCOMM INCORPORATED'S REPLY

¹ Qualcomm Incorporated filed a petition and motion for joinder in IPR2024-01081 and has been joined as a petitioner in this proceeding.

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PETITIONER’S EXHIBIT LIST

Exhibit No.	Description
1001	U.S. Patent No. 7,373,449 (the “’449 Patent”)
1002	File History of U.S. Pat. No. 7,373,449
1003	Declaration of Todd Mowry Ph.D. in Support of Petition for Inter Partes Review of U.S. Patent No. 7,373,449
1004	<i>Curriculum Vitae</i> of Todd Mowry Ph.D.
1005	K. Goossens, et al., <i>Networks on Silicon: Combining Best-Effort and Guaranteed Services</i> (“Goossens2002”)
1006	U.S. Patent No. 5,461,611 (“Drake”)
1007	K. Goossens, et al., <i>Guaranteeing the Quality of Services in Networks on Chip</i> (“Goossens2003”)
1008	Ahmed Amine Jerraya & Wayne Wolf, <i>Multiprocessor Systems-on-Chips</i> , Ch. 1 (2005) (“Wolf”)
1009	Wael Badawy, <i>System on Chip: The Challenge and Opportunities</i> , SYSTEM ON CHIP FOR REAL-TIME APPLICATIONS, 3–16 (2003) (“Badawy”)
1010	Andrei Rădulescu et al., <i>An Efficient On-Chip Network Interface Offering Guaranteed Services, Shared-Memory Abstraction, and Flexible Network Configuration</i> , 2 PROC. DESIGN, AUTOMATION AND TEST IN EUR. CONF. & EXHIBITION 878 (2004) (“Rădulescu”)
1011	A. Campbell et al., <i>Integrated Quality of Service for Multimedia Communications</i> , Computing Dept. Lancaster University (“Campbell”)
1012	D. Kandlur et al., <i>Real-Time Communication in Multihop Networks</i> , IEEE TRANSACTIONS ON PARALLEL AND DISTRIBUTED SYSTEMS, VOL. 5, NO. 10 (1994) (“Kandlur”)
1013	Jose Duato, et al., <i>Interconnection Networks: An Engineering Approach</i> , IEEE COMPUTER SOCIETY PRESS, Ch. 7 (1997) (“Duato”)
1014	Axel Jantsch and Hannu Tenhunen, <i>Networks on Chip</i> , Ch. 1-3 (2003) (“Jantsch”)

1015	David E. Culler and Jaswinder Pal Singh, Parallel Computer Architecture, A Hardware/Software Approach, Ch. 10 (1999) (“Culler”)
1016	Hugo De Man, System-on-chip design: <i>Impact on Education and Research</i> , IEEE DESIGN & TEST OF COMPUTERS, Vol. 16, No. 3, pp. 11-19 (July-Sept. 1999) (“Man”)
1017	ETSI Technical Report, Trans European Trunked Radio (TETRA) system; Technical requirements specification, Part 2: Packet Data Optimised (PDO) systems (January 1994)
1018	U.S. Patent No. 5,828,658 (“Ottersten”)
1019	Joint Claim Construction and Prehearing Statement, <i>Network Sys. Techs., LLC v. Tex. Instruments Inc.</i> , No. 2:22-cv-00482-RWS, Dkt. 84 (E.D. Tex. Aug. 17, 2023)
1020	Pl.’s Opening Claim Construction Br., <i>Network Sys. Techs., LLC v. Tex. Instruments Inc.</i> , No. 2:22-cv-00482-RWS, Dkt. 98 (E.D. Tex. Sept. 27, 2023)
1021	E. Rijpkema et al., <i>Trade-offs in the Design of a Router with Both Guaranteed and Best-Effort Services for Networks on Chip</i> , 150 IEEE PROC.-COMPUT. DIGIT. TECH. 294–302 (2003) (“Rijpkema”)
1022	M. Sgroi et al., <i>Addressing the System-on-a-Chip Interconnect Woes Through Communication-Based Design</i> (2001) (“Sgroi”)
1023	Yasusi Kanada, <i>A Representation of Network Node QoS Control Policies Using Rule-based Building Blocks</i> (2000) (“Kanada”)
1024	IEEE 100, <i>The Authoritative Dictionary of IEEE Standards Terms</i> , p. 344 (“IEEE Dictionary”)
1025	Declaration of Gordon MacPherson regarding K. Goossens, et al., <i>Networks on Silicon: Combining Best-Effort and Guaranteed Services</i>
1026	IEEE Bibliographic Data Regarding K. Goossens, et al., <i>Networks on Silicon: Combining Best-Effort and Guaranteed Services</i>
1027	Declaration of the University of Texas at Austin Libraries regarding “Networks on Chip”
1028	SpringerLink Bibliographic Data Regarding “Networks on Chip”
1029	William J. Dally and Brian Towles, <i>Route Packets, Not Wires: On-Chip Interconnection Networks</i> , Computer Systems Laboratory Stanford University (2001) (“Dally”)

1030	Defendants’ Joint Claim Construction Br. (Excerpts), <i>Network Sys. Techs., LLC v. Tex. Instruments Inc.</i> , No. 2:22-cv-00482-RWS, Dkt. 77 (E.D. Tex. Oct. 12, 2023)
1031	Plaintiff Network System Technologies, LLC’s Responses to Qualcomm’s First Set of Requests for Admission (Nos. 1-9)
1032	Declaration of Peter M. Kohlhepp in Support of Petitioner’s Unopposed Motion for <i>Pro Hac Vice</i> Admission
1033	October 2024 email correspondence between Christopher Angelo and Steve Rosen
1034	November 2024 email correspondence between Peter Kohlhepp and Angelo Christopher
1035	Declaration of Sylvia Hall-Ellis, Ph.D.
1036	U.S. Patent No. 5,461,611 to Drake, marked as exhibit 1036 at the deposition of Dr. Bagherzadeh
1037	Transcript from the January 16, 2025 deposition of Dr. Bagherzadeh
1038	United States Copyright Office page for the Design, Automation and Test in Europe (DATE ’02) Conference Proceedings
1039	Design, Automation and Test in Europe (DATE ’02) Conference Website
1040	Kees Goossens’s Publication Page
1041	IEEE Xplore Press Release – IEEE Xplore Celebrates 15 Years of Information Driving Innovation
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1043	Declaration of Todd Mowry, Ph.D.
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1046	Declaration of Sylvia Hall-Ellis, Ph.D.
1047	Goossens, et. al.; <i>Networks on Silicon: Combining Best-Effort and Guaranteed Services</i> , Design, Automation and Test in Europe 2002
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1050	Exhibits to the declaration of Sage Kruse
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The remaining Challenged Claims (2, 6, 9-16)² are directed to a longstanding networking technique for establishing “connections” to improve quality of service (“QoS”) by providing communication services with certain properties. The Petition showed that these techniques had been used on integrated circuits well before the ’449 patent was filed. It further showed that the claims were only allowed because the Examiner found the cited prior art did not disclose a “resource manager.” However, the prior art does teach such a resource manager, specifically for improving QoS, as shown by Drake.

The Patent Owner’s Response (“POR”) does not challenge any of these conclusions. Instead, it largely recycles arguments it already raised in the Preliminary Response. PO’s argument is ultimately premised on the fact that in the off-chip environment of Drake, the communication manager is described as being in a source station. But PO’s argument ignores the obvious combinations identified in the Petition, as well as the undisputed motivations. As the Institution Decision recognized, Petitioner’s combinations are based on the *Goossens* references and “Petitioner proposes implementing Drake’s QoS management process in the NoC [of Goossens], not modifying an IP block.” Paper 10, 85; *see also id.*, 66. When the Grounds are properly understood in this context, Patent Owner’s (“PO”) challenges fail.

² PO has disclaimed claims 1 and 3-5.

I. CLAIM CONSTRUCTION

A. The Board Need Not Determine Whether the “Communication Manager” Must Be Separate From the “First Module”

PO argues the Board erred in preliminarily concluding the challenged claims did not preclude the “communication manager” from residing in the “first module.” POR, 12-16. But there is no need for the Board to address this issue. The obviousness combinations start with the Goossens references, which describe networks on chip (“NOCs”/“NOS”) with QoS functionality located outside of the IP modules. In the combination, the QoS components (including the communication manager) would still be in the location described in Goossens: outside the IP modules. Ex-1043 ¶¶7, 25-29. Because the communication manager is not inside the first module in the combination, the Board does not need to resolve this claim construction issue. *See Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

B. Communication Manager

The parties agree that no construction of “communication manager” is required for the purpose of resolving this IPR. POR, 16. The Board need not address PO’s discussion of the parties’ positions in the district court. *Vivid Techs., Inc.*, 200 F.3d at 803.

II. THE REMAINING CHALLENGED CLAIMS ARE UNPATENTABLE

A. Petitioner Does Not Take “Inconsistent Positions” Regarding Drake

PO argues that Petitioner and its expert have taken “inconsistent positions” regarding how they map *Drake* to the “first module” claim element. POR, 17-20. This argument is both incorrect and irrelevant.

Petitioner acknowledges that the Board preliminarily found that Petitioner was referring to Drake’s “source station 10” as the first module in Drake. Paper 16, 23-24. However, Petitioner respectfully notes that the Petition and Dr. Mowry consistently point to the “application in the source station” as the thing specifically making the service request. Petition, 27 (“[S]tation 10 is the source of a desired multimedia transmission and comprises an *application 11 which requests a QoS connection...*”), 40-41 (“Drake describes that *an application in a source station (i.e., first module) ‘requests a QoS connection to the destination...*” and specifically highlighting the application 11 in Drake’s Figure 1), 59 (same), 65-66 (same); Ex-1003 ¶¶ 129-131, 177, 195; Ex-1043 ¶¶ 12-15.³ Dr. Mowry also confirmed at his deposition that he was focusing on application 11 within Drake’s source station, as that is the component Drake teaches makes the service request.

³ This brief cites to the Petition in IPR2024-01081, which is what the POR cites.

All other cites are to IPR2024-00338, unless indicated.

Ex-2078, 171:21-176:3; *see also* Ex-1006, 4:27-29 (“application 11 which requests a QoS connection to the destination or target station 29”).

Regardless, PO’s argument is irrelevant because the Petition and Dr. Mowry rely on *Goossens* for the claimed “first module.” *E.g.*, Petition, 21 (“Goossens2002 discloses this limitation”), 31, 40, 55 (“[Goossens2003’s] IPs constitute processing modules”), 59, 62-63, 65, 67. PO does not dispute that the “first module” is disclosed by each of the *Goossens* references. And as the Board recognized in its Institution Decision and discussed further below, in the asserted *combinations* Drake’s QoS requestor manager 12 (the communication manager) is implemented in the NOC of the *Goossens* references, not in the first module (IP block). *E.g.*, Paper 10, 66, 85.

B. Ground 2: The Claims Are Rendered Obvious by Goossens2003 in View of Drake

PO’s arguments in response to Grounds 1 (*Goossens2002/Drake*) and Ground 2 (*Goossens2003/Drake*) are largely the same, except that for Ground 1 PO additionally disputes the “independently configurable[/adjustable]” limitations of claims 2 and 10. Therefore Petitioner will address Ground 2 first. Given the overlap with PO’s Ground 1 arguments, Petitioner will not repeat its explanation for why those arguments are incorrect as they relate to Ground 1 and instead includes parallel citations in parentheses below.

1. A POSA Would Have Been Motivated to Combine Goossens2003 and Drake with a Reasonable Expectation of Success

PO does not dispute that both Goossens2003 and Drake were focused on networks that used QoS systems to provide guaranteed services. PO also does not dispute that Drake's QoS provided the advantages identified in the Petition and by Dr. Mowry. *See e.g.*, Petition, 51-54 (Ground 1: 16-19); Ex-1003, ¶¶160-163 (Ground 1: ¶¶76-79). PO argues that there still would not be motivation to combine, but none of its arguments are persuasive.

a. PO's Arguments Regarding All Challenged Claims

PO's first argument is a general assertion that "On-Chip and Off-Chip Networks Have Different Premises." POR, 6-8. The Board should maintain its preliminary rejection of this argument. *See* Paper 10, 84-85 (Ground 1: 63-66). PO does not contend that Drake is non-analogous art or that a POSA working on network-on-chip technology would avoid looking at off-chip networks. PO merely suggests design choices might be somewhat different and that some development work might be required. But a POSA is "a person of ordinary creativity, not an automaton." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007).

A POSA working on NoCs in 2003 would be familiar with large-scale networks and understand the many parallels. Ex-1003, ¶¶33-34, 156-166 (Ground 1: ¶¶72-82). The Background of the '449 patent itself recognizes 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*.” Ex-1001, 1:61-66 (emphasis added). The evidence shows that POSAs working with on-chip networks looked to and were motivated by off-chip network technology. Ex-1003, ¶¶30-34, 163-166 (Ground 1: ¶82); Ex-1043, ¶¶17-24, 32; *see Innovention Toys, LLC v. MGA Entm’t, Inc.*, 637 F.3d 1314, 1321 (Fed. Cir. 2011) (“A reference is reasonably pertinent if...[it] logically would have commended itself to an inventor’s attention in considering his problem.”).

Second, PO argues the Petition provides inadequate detail about “why and how” the combination would be made. POR, 46-47, 49 (Ground 1: 24-26). But the Grounds are clear. Goossens2003 teaches a NOC and the importance of managing network resources to provide guaranteed services, but “does not describe a component or mechanism for managing resource usage within the NOC or for determining the availability of the resources required.” Petition, 51-54 (Ground 1: 16-20). Drake, on the other hand, discloses a beneficial QoS management process 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.* And Drake’s QoS management uses a communication manager (QoS requestor manager 12) and a resource manager (QoS allocator 20), along with the data path Drake discloses, to do so. *E.g.*, Ex-1003, ¶¶160-163 (Ground 1: ¶¶78-79).

Therefore, a POSA looking at Drake’s detailed example would have been motivated to implement Drake’s QoS process in the network on chip system of Goossens2003. Petition, 51-54, 57-58, 62-63 and Ex-1003, ¶¶156-166, 173, 184-187 (*Ground 1: Petition, 16-20, 23-24, 35-38 and Ex-1003, ¶¶73-82, 90-92, 118-122*); *see also* Ex-1043 ¶¶43-46, 110. This is more than sufficient. *E.g., In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012) (“It is well-established that a determination of obviousness based on teachings from multiple references does not require an actual, physical substitution of elements.”); *Intel Corp. v. Pact XPP Schweiz AG*, 2023 U.S. App. LEXIS 4436, at *9 (Fed. Cir. Feb. 24, 2023) (“Board legally erred in requiring evidence that Arimilli’s specific caching mechanism could be ‘bodily incorporated’ into King’s bus system.”).

PO’s cited cases provide instructive contrasts. *See* POR, 47 (Ground 1: 25-26). *ActiveVideo* and *Braintree* involve unexplained combinations of many different prior art references. *ActiveVideo Networks, Inc. v. Verizon Communs., Inc.*, 694 F.3d 1312, 1327 (Fed. Cir. 2012); *Braintree Labs., Inc. v. Novel Labs., Inc.*, 749 F.3d 1349, 1359 (Fed. Cir. 2014). Here, it is only a two-reference combination and the combination is explained. In *PersonalWeb* and *Nuvasive*, the Petitioner did not identify any benefit that would have been achieved by the combination. *PersonalWeb Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 993-94 (Fed. Cir. 2017); *In re NuVasive, Inc.*, 842 F.3d 1376, 1384 (Fed. Cir. 2016). Here,

testimony from Dr. Mowry explains the significant benefits a POSA would have expected by applying Drake's QoS system in Goossens2003's NOC. Petition, 51-54 (Ground 1: 18-20); Ex-1003, ¶¶ 156-166 (Ground 1: ¶¶72-82). In *Juniper*, the modification required to meet one claim limitation removed structure needed to meet another claim limitation. *Juniper Networks, Inc. v. Smart Path Connections, LLC*, IPR2021-01356, Paper 27 at 48 (PTAB Jan. 19, 2023). No such issue exists here. Ex-1043, ¶44.

Third, PO argues that the "communication manager" (which PO does not dispute is met by Drake's "QoS requestor manager 12" itself) would be "redundant" in Goossens2003. POR, 49-50 (Ground 1: 26-28, 32). But the fact that two references address the same problem is "precisely the reason that there's a motivation to combine under *KSR* and [Federal Circuit] precedent." *Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4d 1373, 1380 (Fed. Cir. 2023). And, as previously noted, a POSA would be motivated by the lack of detail in Goossens2003 regarding the specific component(s) used to implement QoS functionality to look to a reference such as Drake. Petition, 51-54, 62-63 (Ground 1: 16-20, 35-38); Ex-1043, ¶¶23, 44, 50 (Ground 1: ¶¶110, 112). An obvious way to do so would have been to implement Drake's QoS functionality with a communication manager, rather than modify Drake further. Ex-1043 ¶¶50-52 (Ground 1: ¶¶112-114).

PO's "redundancy" argument also ignores the known need for interfacing components in both off-chip and on-chip networks. Ex-1043 ¶¶25-29, 51-52 (Ground 1: ¶¶113-114). A POSA would have known that Goossens2003's NOC would desirably include an interfacing component like Drake's communication manager (QoS requestor manager) because the "re-use[d]" IP blocks Goossens2003 discloses typically used different protocols to describe the type of service it wanted to send data over. Ex-1043 ¶¶51-52 (Ground 1: *id.* ¶¶113-14). Drake indicates that QoS requestor manager 12 provides interfacing. Ex-1043, ¶¶28, 15; Ex-1006, 4:34-35 ("assemble[s] a request"). And Goossens2003 already teaches providing communication management functionality in the "network interface" of the NOC. Ex-1003, ¶¶185-186. Drake just provides a specific example of the component to do that. *Id.*, ¶¶187, 118-122; *see also* Ex-1043 ¶¶29, 50-52 (Ground 1: ¶¶112-114). This is more evidence a POSA would be motivated to use the communication manager component teaching of by Drake, to implement the communication management function already taught by Goossens2003. Ex-1043, ¶48.⁴

⁴ PO wrongly alleges that the Petition is "unclear" on what it maps the "communication manager" to in Ground 2. POR, 47-48. The Petition explains Goossens2003 discloses communication management its network interface, and

PO's fourth argument is that Goossens2003 and Drake teach away from the combination. POR, 50-54 (Ground 1: 28). But PO again misapprehends the combination. Everyone agrees that each of the Goossens references discloses locating the QoS functionality outside the IP blocks (which is what PO contends the claims require). Ex-1037, 78:1-4, 101:11-14 (PO's expert); Ex-1043, ¶¶23, 29, 39, 53-54 (Ground 1: ¶115-116). And as noted above, Goossens2003 already expressly teaches communication management functionality in the network interfaces of its NOC. Ex-1003, ¶¶185-186 (citing Ex-1007, 76-77); Ex-2078, 203:24-204:9 (Goossens2003's network interface would be "a natural place to put" Drake's QoS requestor manager 12); *see also* Ex-1043, ¶¶29, 48, 53.

As the Institution Decision recognized, the proposed combination is "implementing Drake's QoS management process in the NOC [of Goossens2003], not modifying an IP block." Paper 10, 85 (Ground 1: 66). That Goossens2003 teaches implementing QoS components with the NOC (not the IPs) modules is evidence of *obviousness*, not teaching away. The Goossens references *teach*

that—applying PO's definition that would require only a "circuit" that provides that functionality—Goossens2003 would disclose such a communication manager. Petition, 62-63. The Petition then states that in any event, Drake discloses a communication manager. *Id.*

towards what PO contends is the claimed configuration. Ex-1043, ¶¶48, 53 58-60 (Ground 1: ¶115, 120-121). That is the *opposite* of teaching away.

PO's assertion that Drake "expressly teaches away from positioning the QoS requestor manager within a network" is baseless. POR, 52-54 (Ground 1: 29-32). None of the parts of Drake PO cites say that. The mere fact that Drake's off-chip LAN embodiment shows QoS interfacing components located in a "source station" is not teaching away from implementing such components outside of the IP modules *in the network-on-chip environment*. Ex-1043, ¶55 (Ground 1: ¶117); *see also id.* ¶¶26-29.

Aside from simply noting the location of the QoS requestor manager, PO only identifies one citation from Drake in support of its argument: Ex-2006, 2:57-3:3. POR, 52-54 (Ground 1: 29-32). This discussion in Drake does not address the location of QoS requestor manager 12, and it does not show that the combination would have been expected to be "complex." Ex-1043 ¶¶55, 117. It merely suggests that Drake reduces complexity because its QoS management is "almost entirely concentrated in a single QoS management station on the LAN." Ex-1006, 2:65-3:3 (emphasis added). This QoS management "station" corresponds to the QoS allocator 20 station, and Drake's statements are entirely consistent with the proposed combination, which includes a resource manager (QoS allocator) 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”). Ex-1003, ¶173; Ex-2078, 212:20-213:3; Ex-1043 ¶¶55, 117. In short—nothing in Drake “criticize[s], discredit[s], or otherwise discourage[s]” the combination. *Depuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009).

Moreover, a POSITA would have known that in the on-chip context Goossens2003 (and Goossens2002) disclose, the equivalent place for QoS interfacing components like the communication manager *is* outside of the IP modules, such as in the network interface of the NOC. Ex-1043, ¶¶61-62 (Ground 1: ¶¶122-123); Ex-1037, 80:25-81:3, 95:13-22, 103:6-11, 103:24-104:14 (Dr. Bagherzadeh confirming Goossens2002/Goossens2003 network interface components were outside of IP block, in NoC). As noted above, a POSA would also recognize that Drake’s QoS requestor manager 12 was part of Drake’s network interface (Ex-1043 ¶28; Ex-1006, 4:34-35) and Goossens2003 teaches implementing communication management functionality in the network interface of its NOC (Ex-1003, ¶¶185-186; Ex-1043, ¶¶48, 29).

PO also contends that implementing Drake’s QoS requestor manager 12 in Goossens2003’s NOC would be “complex” and beyond the skill of a POSA. POR, 52-53 (Ground 1: 30-31). In doing so, PO tries to improperly incorporate by reference six pages of expert testimony. *Id.* (citing Ex-2070, ¶264, which itself cites ¶¶201-210). As Dr. Mowry explains, the combination would have been easily

within the skill of a POSA. Ex-1003, ¶¶80-82, 164-166; Ex-1043 ¶¶33-39.⁵

Purported “space constraints” and related issues would not have dissuaded a POSA from making the combination. Ex-1043 ¶¶19-24. For example, Goossens2003 already teaches putting communication management functionality in its network interfaces (Ex-1007, 76-77), and Goossens2002 notes a SOC can have “hundreds” of IPs (Ex-1005, 1), indicating chip space/resource constraints were not an overriding concern.⁶ *Id.*

⁵ PO incorrectly contends that Dr. Mowry was “evasive” when asked where Drake’s QoS requestor manager would be implemented in Goossens. Dr. Mowry testified that in Drake it is shown in the network interface, and that would be the “natural place to put it” in Goossens. Ex-2078, 203:24-204:9. As is evident from the transcript, the subsequent testimony PO cites resulted from Dr. Mowry (mis)understanding that PO’s counsel was asking instead about the *resource manager*. Ex-1043 ¶¶155-57.

⁶ For Ground 1, PO also contends a POSA would have understood that QoS requestor manager 12 is “software” that “could not be outside of the source station.” POR, 30. But Drake indicates QoS requestor manager 12 is a “component,” (Ex-1006, 4:34-35, Fig. 1) and a POSA would understand such a separate “component” would not be software and in any event could easily be

Finally, PO's argument about the claimed resource manager (POR, 54-55 (Ground 1: 32-33)) is unsupported. Petitioner explained the why and how. Drake provides an exemplary resource management system that would be expected to "improve the efficiency and performance of Goossens2003's network on chip". Ex-1003, ¶¶156-166, 173; Petition, 51-54, 57-58. And the combination itself shows where Drake's QoS allocator would receive requests from: Goossens2003's IP module (the unit making the request) through Drake's QoS requestor manager 12 (data path shown in Drake). Petition, 61-62; Ex-1043 ¶¶43-45. PO's "fundamentally different architectures" argument is not supported for the same reasons explained above. PO's argument also seems to imply a false dichotomy, that because Drake shows a resource manager that is not "within" a LAN, in Goossens2003 it must go in the IP module. POR, 54-55. A POSITA would not have such a constrained view. Ex-1003, ¶173 (POSITA motivated to implement functionality of QoS allocator "in a circuit on the same integrated circuit chip as Goossens2003's IP blocks and NOC"); Ex-2078, 212:16-213:10; Ex-1043 ¶¶38, 45, 61-62 (Ground 1: ¶122-123).

implemented apart from the source station. Ex-1043, ¶¶118-119; *see also id.* ¶¶30-31, 56-57.

b. PO's Motivation Arguments Regarding Claims 6 and 10

For limitation 6[a]-6[d], PO repeats its argument that it would have been “redundant and unnecessary” to include a communication manager and a resource manager in Goossens2003, rather than have the resource manager communicate “directly” with the module. POR, 56-60 (Ground 1: 34-37). As explained above, however, there are good reasons a POSA would have been motivated to follow Drake's teaching of including a communication manager in the network interface to facilitate communication with the resource manager. *Supra*, §II.B.1.a; *see also* Ex-1043 ¶¶64-67 (Ground 1: ¶¶125-128). And 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). Ex-1043 ¶¶68-71 (Ground 1: ¶¶129-132).⁷

2. The Combination of Goossens2003 and Drake Discloses the “Communication Manager” and “Resource Manager” Claim Limitations

a. “Communication Manager”

The Goossens2003/Drake (and Goossens2002/Drake) combination discloses the “communication manager.” PO's argument to the contrary is based on the false

⁷ Dr. Mowry did not “admit” that in the combination the request/response would have gone directly to/from the resource manager. Ex-1043, ¶70 (Ground 1: ¶131).

premise that “Petitioner relies on Drake’s source station 10 for the claimed ‘first module.’” POR, 60-61 (Ground 1: 38). As noted above, the Petition relies on Goossens2003 for the modules. Petition, 55 (“[Goossens2003’s] IPs constitute processing modules”) and 65 (Ground 1: 21-22, 40-41) (same)). Therefore, in the *combination*, the communication manager would be outside of the IP module. *Id.*; Ex-1043 ¶¶72-77 (Ground 1: ¶¶115, 120, 133-136)); *see also* Ex-1043, ¶¶46, 27, 29.

PO also contends that Petitioner did not attempt to analyze communication manager under a Section 112, ¶6 construction. POR, 61 (Ground 1: 39). But as noted above, the Petition did not contend any construction was needed, the Institution Decision found none required, and PO also does not now argue any is needed.

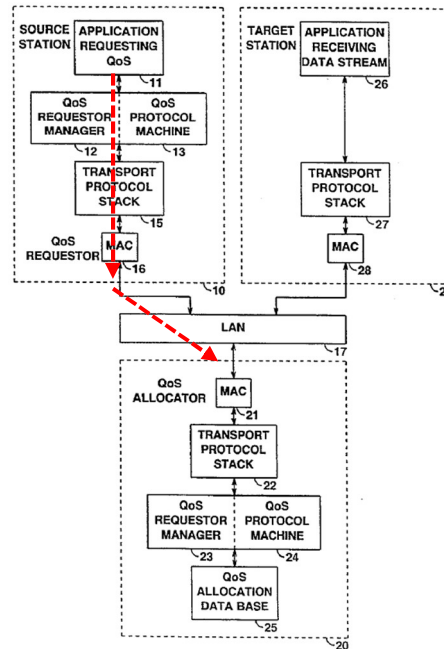
For Ground 2, Goossens2003 *also* discloses a communication manager under the construction PO proposed in district court litigation. Petition, 62-63. PO contends that Petitioner does not explain how the “same element” can be both a network interface and a communication manager. POR, 61. Nothing in the claim language precludes the communication manager from being implemented as part of the network interface, and the ’449 patent expressly teaches it can be. Ex-1001, 10:5-6

b. Elements 6[a] and 10[a]

PO's argument again ignores the combination. PO argues that *Drake* does not teach that "source station 10 (alleged 'first module') issues a request to" the QoS requestor manager. POR, 62 (Ground 1: 39). The Petition relies on *Goossens' IP module* as the "first module" that "issue[s] [a] request." Petition, 65-66 (Ground 1: 40-41). PO *does not dispute* that Goossens2003 (and Goossens2002) discloses this element, and as discussed above in the combination the QoS requestor manager would be outside the IP modules. Therefore, the *combination* of Goossens2003 (or Goossens2002) and Drake meets this claim element. *Id.*; *see also* Ex-1043 ¶¶78-81 (Ground 1: ¶¶137-140).

c. Elements 6[b] and 10[b]

PO's argument that a POSA would understand that Drake teaches the request to the QoS allocator is sent "from source station 10," not from the QoS requestor manager 12 located *in* source station 10 is unsupported. Drake's Figure 1 is not a black box. It shows the components that forward the request within source station 10. Drake teaches that QoS requestor manager 12 specifically "assemble[s] a request" and "utilizes QoS protocol machine 13 to format the QoS request," and then the request is sent by "source station 10" to the QoS allocator. *E.g.*, Ex-1006, 4:32-37, 4:62-65, 4:50-54; *see also* Petition. Drake's Figure 1 shows only one path through the components in source station 10:



Ex-1006, Fig. 1 (annotated); Ex-1043 ¶83 (Ground 1: ¶142). Dr. Bagherzadeh agrees. Ex-1037, 53:21-56:13; Ex-1036. Thus, when Drake says that the request to QoS allocator 10 comes from “source station 10,” a POSA knows that QoS allocator 12 in source station 10 “forward[ed] the request” as claimed—there is no alternative path disclosed. Ex-1043 ¶84 (Ground 1: ¶143).

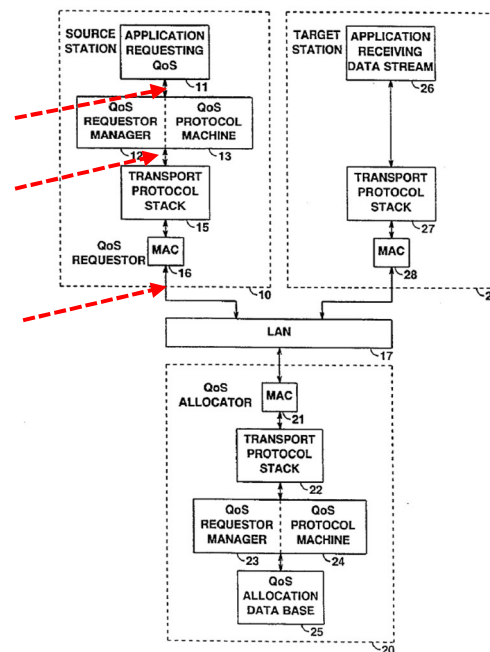
PO’s argument that the “transport protocol stack 15 and/or MAC entity 16” forwards the request, not the QoS requestor manager, fares no better. POR, 42. PO’s expert points to Drake’s teaching that *after* the QoS requestor manager 12 (along with QoS protocol machine 13) “assemble a request,” there is another step—“ transport protocol stack 15 and MAC entity 16 for formatting and launching [the request] on LAN 17.” Ex-2070, ¶288 (Ground 1: ¶221). But Drake’s QoS requestor manager 12 still “forwards the request” to the resource manager.

Ex-1043 ¶¶85-86 (Ground 1: ¶144-45). Nothing in the claim language precludes the possibility that the request forwarded by the communication manager passes through other components before reaching the resource manager. Ex-1043 ¶87 (Ground 1: ¶146).

d. Elements 6[c] and 10[d]

PO contends that Drake does not teach elements 6[c] and 10[d] because Drake purportedly teaches that “QoS allocator 20 sends the QoS allocation reply [only] to source station 10,” citing Drake (Ex-1006) at 4:54-57, 8:20-29, 14:22-27, 11:22-48, and 9:52-10:2. *See* POR, 43-44 (same analysis incorporated for Ground 2, Paper 35, 63). However, the cited portions only reinforce that Drake discloses sending the reply to the communication manager, as elements 6[c] and 10[d] require. *E.g.*, Ex-1006, 14:22-27 (“AllocationReply message is...sent from allocator station 20..to source station 10”); Ex-1043 ¶89-93 (Ground 1: ¶148-53). Drake teaches that QoS requestor manager 12 is in source station 10 and is the thing that “interacts with application 11 using internal messages.” Ex-1006, Fig. 1, 4:62-64. A POSA would understand that the only way Drake’s QoS system works is for the reply from QoS allocator 20 to get back to application 11 in source station 10, the entity that made the QoS request in the first place. Ex-1043 ¶93 (Ground 1: ¶153); Ex-1037, 59:22-60:2 (“Q: But [the message] does go from QoS allocator to application requesting QoS? A: Yes.”). And Drake only shows one path

for that reply, and it goes first to the QoS requestor manager 12 that interfaces with application 11. This is clear from Figure 1, which also shows double-headed arrows:



Ex-1006, Fig. 1. Dr. Bagherzadeh agrees. Ex-1037, 60:3-61:13; Ex-1036. Drake teaches—and a POSA understands—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. Ex-1043 ¶90 (Ground 1: ¶149).

PO contends that the reply from the QoS allocation “would not have necessarily been sent to QoS requestor manager” and “instead, the reply would be sent to application 11.” POR, 44 (*see also id.* 63, incorporating Ground 1 response). But as explained above, Drake teaches that reply data reaching application 11 is first sent to the QoS requestor manager 12. *See also* Ex-1043

¶¶91-92 (Ground 1: ¶¶151-52). There is no bypass indicated. *See* Ex-1037, 60:3-61:13 (PO’s expert).

e. Elements 6[d] and 10[e]

PO disputes elements 6[d] and 10[e] only “to the extent that Petitioner relies on Drake’s application 11 as the claimed ‘first module.’” POR, 63 (Ground 1: 45). Again, PO simply ignores the combination. In the combination, Goossens2003 provides the first and second modules that the connection is established between. *E.g.*, Petition, 55, 65-66 (Ground 1: 21-22, 40-41). PO does not dispute this.

C. Ground 1: The Claims Are Rendered Obvious by Goossens2002 in View of Drake

For Ground 1, PO makes essentially the same arguments described above. *Compare* POR, 24-45 (Ground 1) *with* 45-64 (Ground 2). Those arguments fail for the same reasons. *Supra* §II.B (which includes parallel citations to briefing and evidence for Ground 1).

PO makes one additional argument for Ground 1. PO contends that neither Goossens2002 or Drake show channels with connection properties that are “adjustable independently” (claim 1) or “independently configurable” (claim 10). POR, 21-24. As explained in the Petition, both Goossens2002 and Drake disclose this limitation.

Goossens2002. Goossens2002 teaches that each channel may be given different properties, such as “best effort (BE)” and “combined throughput and latency guarantee (GT).” Petition, 29.

PO argues that Goossens2002 does not expressly say that “each” channel has certain connection properties. But that is exactly what a POSA would understand Goossens2002 to teach. Ex-1043 ¶98. Goossens2002 discloses examples of “a channel” having certain connection properties (e.g., BE, GT). Ex-1005, 3. Goossens2002 then explains “a connection combines multiple channels.” *Id.* A POSA would understand the described options for a channel apply to *each* channel in a connection. Ex-1043 ¶98. Further, Goossens2002 expressly says that Aethereal NOS “support[s] *both* guaranteed [GT] and best-effort [BE] services,” and therefore includes both channels. Ex-1005, 3 (emphasis added); Ex-1043 ¶99. PO’s expert asserts that a POSA “would not assume” the options for GT or BE services apply to each channel but does not explain why. Ex-2070, ¶155.

Drake. PO contends that a POSA would understand (1) Drake is limited to a Token Ring network, (2) Token Ring networks employ “duplex channels,” and (3) therefore Drake discloses only a “single channel.” POR, 23-24. A POSA would not have any of these understandings.

First, Drake's disclosure is not limited to Token Ring networks—that is merely an “example.” Ex-1006, 4:22-23. ; Ex-1043 ¶102. PO's expert agrees. Ex-1037, 65:13-66:4.

Second, the documents PO cites do not show that Token Rings employ only duplex *channels*. Rather, they show Token Rings operated in “duplex *communication*.” Ex-1043 ¶¶103-106. That does not mean using only a single *channel*. Ex-1043 ¶106. The '449 patent itself uses the term “connection” to describe full-duplex communication that uses separate (i.e., multiple) request and reply channels. *E.g.*, Ex-1001, 8:50-60.

Third, the preferred embodiment of Drake supports multiple independent channels. For example, the algorithm for allocating a QoS transmission path supports multiple QoS transmission paths; in other words, multiple channels. Ex-1043 ¶107; Ex-1006, 10:9-11:48. Drake also describes using multiple “data streams,” additional disclosure of multiple channels. *E.g.*, Ex-1006, Abstract, 5:8-14, 6:62-63.

Thus, this limitation is met because (1) Goossen2002 teaches it; and (2) even if not it would have been obvious in view of Drake. Ex-1003, ¶¶103-107; Ex-1043 ¶¶96-108.

III. The References Are Prior Art

PO does not dispute that the earliest priority date PO is entitled to is October 7, 2003. The Institution Decision found Petitioner's evidence showing that Goossens2003 and Goossens2002 were publicly accessible prior to October 7, 2003 preliminarily sufficient. PO's Response provides no persuasive rebuttal evidence.

A. Petitioner Complied With the Board's Rules

The Board found that the Petition's citations to evidence were not improper. Institution Decision (-00338 IPR), 29; Institution Decision (-01081 IPR), 12 (finding the same). In cases like this, the Board has repeatedly rejected PO's argument. *E.g., Tetra Tech Canada Inc., v. Georgetown Rail Equip. Co.*, IPR2019-00619, Paper 12 at 19 (P.T.A.B. Aug. 26, 2019).

B. Goossens2003

Two different librarian declarations show Goossens2003 was published, shelved, and catalogued prior to October 7, 2003. Sean O'Bryan testifies that a textbook containing Goossens2003 was catalogued in the University of Texas ("UT") libraries' collection by April 16, 2003. Ex-1027, ¶¶1-8. Dr. Hall-Ellis similarly testifies that Goossens2003 was "published and accessible to the public" by May 12, 2003, including catalogued in the Library of Congress by that date. Ex-1035, *e.g.*, ¶¶41-53. Moreover, the textbook containing Goossens2003 bears conventional indicia of publication. Ex-1027, 8 (*e.g.*, ISBN number, commercial

publisher, copyright date); Ex-1035, p.103 (same). PO provides *no rebuttal evidence*.

PO argues that O'Bryan did not work at UT during the relevant timeframe and was unfamiliar with "several" MARC codes, but O'Bryan testified he was "familiar" with UT Libraries' record keeping practices and records. Ex-1027, ¶¶4-8 and "*Note" (explaining the "UT DATE" in the record). That is more than sufficient. *Conoco Inc. v. Dept. of Energy*, 99 F.3d 387, 391 (Fed. Cir. 1996) ("custodian or other qualified witness...need not be the person who prepared or maintained the records...as long as the witness understands the system used to prepare the records"). PO also argues the evidence does not show which UT library. However, PO does not dispute that the textbook was catalogued at UT libraries, and book itself indicates it was checked out prior to October 2003. *See* Ex-1027, 6 (stamped due date of "Aug 27 2003"). Moreover, Hall-Ellis separately explains that by May 12, 2003 a copy of the textbook had been "cataloged and indexed at the Library of Congress" Ex-1035, ¶47; *see also id.* ¶46.

Bibliographic data (Ex-1028, 4) provides yet more evidence. PO's cases are inapposite. In each of *Geophysical* and *Adobe*, the paper had no conventional indicia of publication and the exhibit cited did not indicate what the date meant. Here, the Springerlink Ex-1028 provides an ISBN that matches the textbook ("14020-7392") and clearly indicates "Published: 31 January 2003."

C. Goossens2002

The evidence shows Goossens2002 was publicly available to POSAs exercising reasonable diligence prior to October 7, 2003.

Goossens2002 was publicly available on IEEE Xplore by August 7, 2002. Evidence includes (1) conventional indicia of publication such as established publisher (IEEE), “©2002”, ISSN number, price (Ex-1005, 1; Ex-1026, 1); (2) “Date Added to IEEE Xplore: 07 August 2002” (Ex-1026, 1); and (3) an IEEE supporting declaration (Ex-1025, *e.g.*, ¶7 (“regular practice of IEEE to publish articles...and make them available to the public through IEEE Xplore”), ¶10 (“The article and abstract from IEEE Xplore shows the date of publication”).

Additional evidence that Goossens2002 was publicly available before 2003 includes:

- IEEE testimony that Goossens2002 was published in the proceedings of March 4-8, 2002 DATE conference and “made available no later than the last day of the conference” to participants (Ex-1025, ¶11; *see also* Ex-2080, 12:18-25, 21:11-22:9 (same));
- Testimony from a POSA who attended DATE 2002 (Dr. Dutt), corroborating that a copy of the proceedings was distributed to the at least 400-500 conference participants, without confidentiality restrictions (Ex-1044, ¶¶11-23, *see also id.* ¶¶5-10);

- IEEE bibliographic data (Ex-1026);
- Testimony from Dr. Mowry (Ex-2078, 124:4-125:21, explaining DATE was a “major” conference, common practice of such conferences to “make their proceedings available to the participants”);
- U.S. Copyright (Ex-1038) and Library of Congress (Ex-1048), and IEEE Computer Society (Ex-1051) showing 2002 publication, library copy of the proceedings (Ex-1047), and testimony supporting same (Ex-1046, ¶¶19-25).
- DATE conference’s archive of proceedings (Ex-1039).

Contrary to PO’s argument, neither cataloging nor indexing is required.

Hulu, LLC v. Sound View Innovations, LLC, IPR2018-01039, Paper 29 at 9-10 (P.T.A.B. Dec. 20, 2019) (precedential). A document is publicly accessible if it “has been 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.” *Id.*, 10-11. “[W]hen 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). IEEE is an established publisher; PO has not rebutted the presumption.

In addition, POSAs in early 2002 frequently reviewed publications on IEEE Xplore and attended IEEE-sponsored conferences like DATE 2002 for information

on relevant technologies. Ex-1044, ¶¶6, 23-29; Ex-1039, 6 and 10-11 (“Welcome” message referencing “large systems on chip”; Goossens2002 presented at “Hot Topic-Network on a Chip”); Ex-1046, ¶¶11-18 (Xplore available at universities, reasonably accessible to POSAs).

PO’s argument that IEEE’s metrics show no full-text views prior to 2011 does not rebut the presumption, much less overcome the additional evidence. Exhibit 2083 at best indicates IEEE may not have begun *tracking* full text views until 2011. Ex-1049, Ex-1050. Moreover, public accessibility does not require showing actual views. *Hulu*, IPR2018-01039, Paper 29, 10.

Finally, unlike the *Lister* case PO cites, there is evidence “pertaining to the general practices” of IEEE. The IEEE declarant’s un rebutted testimony indicates he is familiar with IEEE publishing practices in the relevant time. *E.g.*, Ex-1025, ¶¶1-11; Ex-2080, 8:22-11:9, 21:11-22:15; *see also Conoco*, 99 F.3d at 391.

IV. The Petition Is Not Time Barred

As Board found in its Institution Decision, Qualcomm’s Petition was timely. Paper 16, 15-17 (citing 37 C.F.R. § 42.122(b)).

Respectfully submitted,

Dated: January 27, 2025

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CERTIFICATION OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e) and the agreement of the parties, the undersigned certifies that on January 27, 2025, a true and correct copy of the foregoing Petitioner's Reply to Patent Owner's Response to the Petition was served via electronic mail upon the following:

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