

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

QUALCOMM INCORPORATED and
SAMSUNG ELECTRONICS CO., LTD.,
Petitioner,

v.

NETWORK SYSTEM TECHNOLOGIES, LLC,
Patent Owner.

IPR2024-00343
Patent 7,594,052 B2

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

KENNY, *Administrative Patent Judge*.

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

I. INTRODUCTION

Qualcomm Incorporated and Samsung Electronics Co., Ltd. (“Qualcomm,” “Samsung,” and collectively, “Petitioner”) filed a Petition to institute an *inter partes* review of claims 1–7 (the “challenged claims”) of U.S. Patent No. 7,594,052 (Ex. 1001, the “’052 patent,” “challenged patent”) pursuant to 35 U.S.C. § 311 *et seq.* Paper 3 (“Pet.”). Network Systems Technologies, LLC (“Patent Owner”) filed a Preliminary Response. Paper 7 (“Prelim. Resp.”). With our authorization, Petitioner filed a Preliminary Reply (Paper 9, “Prelim. Reply”), and Patent Owner filed a Preliminary Sur-reply (Paper 10, “Prelim. Sur-reply”).

The Petition, to justify institution of review, must demonstrate a reasonable likelihood that Petitioner would prevail with respect to at least one challenged claim. *See* 35 U.S.C. § 314(a) (2018). After considering the Petition, the Preliminary Response, the Preliminary Reply, the Preliminary Sur-reply, and the evidence of record, we determine that the Petition has met this standard. Further, we decline to discretionarily deny *inter partes* review. Therefore, we institute an *inter partes* review of claims 1–7 of the ’052 patent.

A. Related Matters

The parties identify the following related district court litigations:

Network System Technologies, LLC v. Samsung Electronics Co., 2:22-cv-00481 (E.D. Tex.) (the “Samsung litigation”);

Network System Technologies, LLC v. Qualcomm Inc., 1:22-cv-01331 (W.D. Tex.) (the “Qualcomm litigation”);

Network System Technologies, LLC v. Texas Instruments Inc., 2:22-cv-00482 (E.D. Tex.) (the “TI litigation”);

Network System Technologies, LLC v. Lenovo Group Ltd., 2:23-cv-00167 (E.D. Tex.);

Network System Technologies, LLC v. Ford Motor Co., 2:23-cv-00440 (E.D. Tex.); and

Network System Technologies, LLC v. OnePlus Technology (Shenzhen) Co., 2:23-cv-00520 (E.D. Tex.).

Pet. 79–80; Paper 5, 2.

The parties identify the following related IPRs:

IPR2024-00338;

IPR2024-00339; and

IPR2024-00355.

Paper 5, 3.

B. Challenged Patent

The '052 patent “relates to an integrated circuit having a plurality of processing modules and an interconnect means for coupling said plurality of processing modules and a method for communication service mapping in such an integrated circuit.” Ex. 1001, 1:6–10. In particular, the '052 patent relates to “systems on chip, i.e. a plurality of modules on the same chip (including e.g. system in a package, multi-die modules) or on different chips, communicate with each other via some kind of interconnect.” *Id.* at 4:43–46. The described interconnect “is embodied as a network on chip NOC [network on a chip], allowing communication between all aforementioned modules.” *Id.* at 4:46–48.

Figure 1 of the '052 patent is shown below:

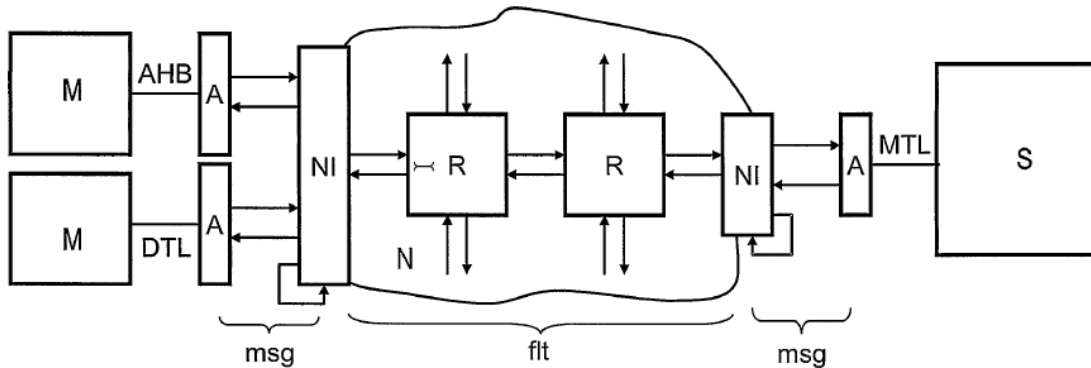


FIG.1

Figure 1 above “shows a basic block diagram of a network on chip.”

Ex. 1001, 4:30–32. This figure depicts “two master modules M and a slave module S each with an associated network interface NI.” *Id.* at 5:8–9.

“Between network interfaces and its associated master M and slave S an adapter unit A is arranged, respectively.” *Id.* at 5:10–11. “The network N may be comprised of a plurality of interconnected network routers R.” *Id.* at 5:25–26.

Figure 4 of the '052 patent is shown below:

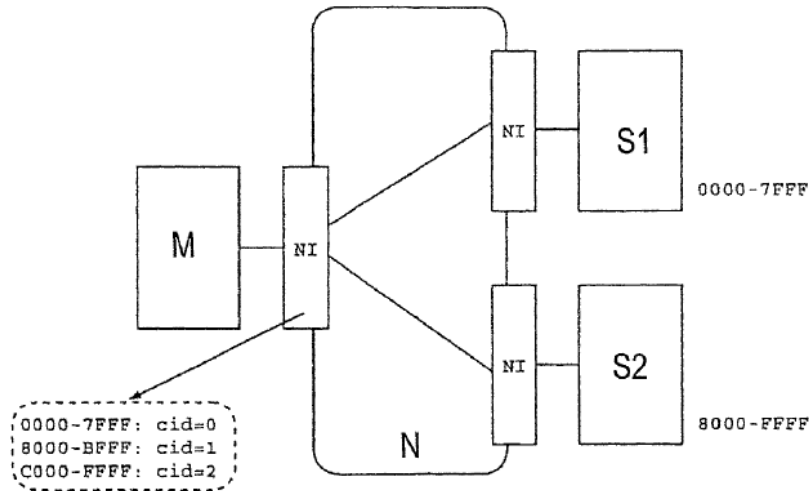


FIG.4

Figure 4 above “shows a basic block diagram of a network on chip for illustrating the operation of the mapping of IP block communication via address ranges to connections.” *Id.* at 8:7–9. “The network on chip comprises a master M and two slaves S1, S2 each being connected to a network via a network interface NI, respectively.” *Id.* at 8:9–12. “The two slaves S1, S2 are implemented as memories, wherein the first slave S1 comprises the address range 0000-7FFF and the second slave S2 comprises the address range 8000-FFFF.” *Id.* at 8:12–15. Accordingly, the network interface NI associated to the master M: “may map the communication to the first slave S1, i.e., [] to the address range 0000-7FFF, to a connection with the connection id cid=0 and the communication to the second slave S2, i.e., [] to the address range 8000-FFFF, to a connection with the connection id cid=1.” *Id.* at 8:15–20.

C. Challenged Claims

Petitioner challenges claims 1–7. Pet. 1. Claims 1, 6, and 7 are independent and read:

- 1.¹ [1.pre] Integrated circuit, comprising:
 - [1.a] a plurality of processing modules (M, S), [1.b] wherein at least one first of said processing modules (M) requests at least one communication service to at least one second processing module (S) based on specific communication properties and at least one communication service identification,
 - [1.c] an interconnect means (N) for coupling said plurality of processing modules (M, S) and for enabling a connection based communication having a set of connection properties,
 - [1.d] at least one network interface (NI) associated to said at least one first of said processing modules for controlling the communication between said at least one first of said plurality of processing modules (M) and said interconnect means (N), and
 - [1.e] a mapping means (A) for mapping the requested at least one communication service based on said specific communication properties to a connection based on a set of connection properties according to said at least one communication service identification, [1.f] wherein said at least one communication service identification comprises at least one communication thread or at least one address range, said address range for identifying one or more second processing modules (S) or a memory region within said one or more second processing modules (S).

¹ For ease of reference, we include the bracketed designations provided in the Petition for the preamble recitations and limitations of claims 1, 6, and 7.

6. [6.pre.1] Method of communication service mapping in an integrated circuit, having a plurality of processing modules (M, S),
 - [6.pre.2] wherein at least one first of said processing modules (M) requests at least one communication service to at least one second processing module (S) based on specific communication properties and at least one communication service identification, wherein said at least one communication service identification comprises at least one communication thread or at least one address range, said address range for identifying one or more second processing modules (S) or a memory region within said one or more second processing modules (S), comprising the steps of:
 - [6.a] coupling said plurality of processing modules (M, S) by an interconnect means (N) and
 - [6.b] enabling a connection based communication having a set of connection properties,
 - [6.c] controlling the communication between said at least one first of said plurality of processing modules (M) and said interconnect means (N) by at least one network interface (NI) associated to said at least one first of said processing modules,
 - [6.d] mapping the requested at least one communication service based on said specific communication properties to a connection based on a set of connection properties according to said at least one communication service identification.
7. [7.pre] Data processing system, comprising
 - [7.a] a plurality of processing modules (M, S), [7.b] wherein at least one first of said processing modules (M) requests at least one communication service to at least one second processing module (S) based on specific communication properties and at least one communication service identification, [7.c] wherein said at least one communication service identification comprises at least

one communication thread or at least one address range, said address range for identifying one or more second processing modules (S) or a memory region within said one or more second processing modules (S),

[7.d] an interconnect means (N) for coupling said plurality of processing modules (M, S) and for enabling a connection based communication having a set of connection properties,

[7.e] at least one network interface (NI) associated to said at least one first of said processing modules for controlling the communication between said at least one first of said plurality of processing modules (M) and said interconnect means (N), and

[7.f] a mapping means (A) for mapping the requested at least one communication service based on said specific communication properties to a connection based on a set of connection properties according to said at least one communication service identification.

Ex. 1001, 9:24–50, 10:7–59.

D. Asserted Challenges to Patentability and Prior Art

Petitioner challenges claims 1–7 based on the grounds in the table below:

Ground	Claim(s) Challenged	35 U.S.C. § ²	Reference(s)
1	1, 2, 5–7	102	Rădulescu2004 ³

² The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), amended 35 U.S.C. §§ 102 and 103, effective March 16, 2013. Because the ’052 patent issued from an application filed before that date, we refer to the pre-AIA version of §§ 102 and 103.

³ A. Rădulescu, et al. “*An Efficient On-Chip Network Interface Offering Guaranteed Services, Shared-Memory Abstraction, and Flexible Network Configuration*,” Proceedings of the Design, Automation and Test in Europe Conference and Exhibition, 2004 (Ex. 1005).

Ground	Claim(s) Challenged	35 U.S.C. § ²	Reference(s)
2	1–7	103	Rădulescu2004, OCP ⁴
3	1–7	102	Weber ⁵
4	1–7	103	Weber, Rădulescu2004

Pet. 3–4

Petitioner submits a declaration with proffered expert testimony from Dr. Marwan Hassoun (Ex. 1003). Patent Owner submits a declaration with proffered expert testimony from Dr. Erik Chmelar (Ex. 2001).

II. LEVEL OF SKILL AND CLAIM CONSTRUCTION

A. Level of 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 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 an ordinarily skilled artisan at the time of the alleged invention have had at least either a Master’s degree in Electrical

⁴ Open Core Protocol Specification, Release 1.0, OCP-IP Association (2001) (Ex. 1006).

⁵ U.S. Patent Publication No. 2002/0129173 A1 (Ex. 1007).

Engineering or a related field (such as computer science or computer engineering), as well as at least three years of work experience in the field of SoC (systems on chip) design, or a Bachelor's degree in Electrical Engineering or a related field, as well as at least five years of work experience in the field of SoC. Pet. 13–14. Petitioner further asserts that an ordinarily skilled artisan would have had an understanding of SoC interconnects, as well as the concepts of large-scale networks. *Id.* at 14.

In this proceeding, Patent Owner has not challenged Petitioner's definition for an ordinarily skilled artisan. *See generally* Prelim. Resp. In the Qualcomm litigation, however, Patent Owner described a person of ordinary skill in the art as having:

a Bachelor of Science (or equivalent) degree in electrical engineering, computer engineering, or a related field, and 2–3 years of work experience in very large-scale integrated (“VLSI”) systems, such as application-specific integrated circuits (“ASICs”), application-specific standard parts (“ASSPs”), system-on-chip (“SoC”), or field programmable gate arrays (“FPGAs”), and has an understanding of on-chip interconnection networks.

Ex. 1017, 11.

In this proceeding, Petitioner's definition is uncontested and appears consistent with the level of skill reflected in the specification of the '052 patent (“Specification”) and in the asserted prior-art references. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). Thus, for purposes of this Decision, we adopt Petitioner's definition. We note, however, that we would reach the same conclusions in this Decision if we were to adopt the definition that Patent Owner set forth in the Qualcomm litigation. To the extent the parties dispute the definition of an ordinarily skilled artisan during

trial, we encourage the parties to address whether the dispute would impact the patentability analysis.

B. Claim Construction

Petitioner requests that we construe two terms: “interconnect means,” recited in claims 1, 6, and 7; and “mapping means,” recited in claims 1 and 7. Pet. 10–13. Patent Owner requests that we also construe “connection,” recited in claims 1 and 3–7. Prelim. Resp. 23–24. For purposes of this Decision, we address only the construction of “interconnect means” because we do not need to construe any other claim term to determine whether Petitioner has demonstrated a reasonable likelihood of prevailing with respect to a challenged claim.

1. Interconnect Means

a. Proposed Constructions

The parties propose the following constructions for “interconnect means”:

Term	Petitioner’s Proposed Construction	Patent Owner’s Proposed Construction
“interconnect means”	Subject to Section 112 ¶ 6 Function (claims 1, 6, and 7): coupling said plurality of processing modules (M, S). Additional Function (claims 1 and 7): enabling a connection based communication having a set of connection properties Structure: any of a bus, switch, point-to-point wire, or network.	“multi-hop interconnection between modules separated by one or more network nodes”

Pet. 10; Prelim. Resp. 9.

In support of its proposed construction, Petitioner argues that “interconnect means” is presumptively governed by section 112 ¶ 6. Pet. 10. Petitioner further argues that the function for the interconnect means in claim 6 is coupling said plurality of processing modules (M, S). *Id.* Further, Petitioner asserts that the functions for claims 1 and 7 are coupling said plurality of processing modules (M, S) and enabling a connection-based communication having a set of connection properties. *Id.* Petitioner further contends that the Specification identifies a bus, switch, point-to-point wire, and network as examples of an interconnect means. *Id.* (citing Ex. 1001, 1:50–52, 2:32–42, 4:43–50.).

Regarding Patent Owner’s proposed construction, Patent Owner argues that it proposed the same construction in the Samsung litigation. Prelim. Resp. 9. Further, Patent Owner asserts that, in the Samsung litigation, Samsung initially proposed that “interconnect means” should have its plain and ordinary meaning, but subsequently agreed to Patent Owner’s construction. *Id.* Patent Owner argues that, in the Qualcomm litigation, Patent Owner and Qualcomm proposed the same constructions that they propose here. *Id.* Further, Patent Owner asserts that, in the TI litigation, the district court adopted Patent Owner’s proposed construction for “interconnect means.” *Id.*

Patent Owner explains that the district court, in the TI litigation, determined that the ’052 patent uses the terms “interconnect means” and “network” interchangeably. Prelim. Resp. 10 (citing Ex. 2022, 47–49). Patent Owner further explains that the district court, in the TI litigation, construed “network” to mean multi-hop interconnection between modules separated by one or more network nodes, which was the construction that the

parties in the TI litigation had stipulated for that term. *Id.* (citing Ex. 2022, 6, 24).

Patent Owner argues that “interconnect means” should not be construed to be a means-plus-function limitation because the ’052 patent discloses that the interconnect means is part of an integrated circuit, which has a structure. Prelim. Resp. 13. Patent Owner also disputes Petitioner’s argument that, as a means-plus-function limitation, the structure corresponding to the interconnect means is a bus, switch, point-to-point wire, or network. *Id.* at 15. Patent Owner argues that the ’052 patent repeatedly distinguishes patented NOC technology from buses, switches, or point-to-point wires. *Id.*

b. District Court Constructions

The district court, in the TI litigation, construed “interconnect means” as a “multi-hop interconnection between modules separated by one or more network nodes.” Ex. 2022, 51. The district court, in the Samsung litigation, does not appear to have issued its claim construction order yet, but the parties in that litigation have stipulated that “interconnect means” is a “multi-hop interconnection between modules separated by one or more network nodes.” Ex. 2033, 12; Ex. 2035, 2 n.2. The district court, in the Qualcomm litigation, also does not appear to have issued its claim construction order yet, and the parties in that litigation do not appear to have stipulated to a construction of “interconnect means.” Ex. 2040, 22.

At the moment, we do not have a decision from a district court that has addressed whether the term “interconnect means” is a means-plus-function limitation. The parties in the TI and Samsung litigations do not appear to have raised that issue with the district court in those litigations (Ex. 2022, 47–51; Ex. 2035, 2 n.2), and, as mentioned, we do not yet have a claim

construction decision from the district court in the Qualcomm litigation. Therefore, for this Decision, we address whether the term “interconnect means” is a means-plus-function limitation without the benefit of a district court’s analysis on that issue.

c. Means-Plus-Function Limitation

The term “interconnect means” includes the word “means” and thus presumptively is a means-plus-function limitation governed by pre-AIA 35 U.S.C. 112 ¶ 6.⁶ *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1348–49 (Fed. Cir. 2015) (en banc in cited part); *Personalized Media Commc’ns, LLC v. Int’l Trade Comm’n*, 161 F.3d 696, 703 (Fed. Cir. 1998). “[This] presumption may be rebutted if the properly construed claim limitation itself recites sufficiently definite structure to perform the claimed function.” *Kemco Sales, Inc. v. Control Papers Co.*, 208 F.3d 1352, 1361 (Fed. Cir. 2000).

As mentioned, Patent Owner argues that the structure for the term “interconnect means” is an integrated circuit. Prelim. Resp. 13. The term “interconnect means,” however, does not recite an integrated circuit. Thus, on this record, the presumption is not overcome, and we preliminarily conclude that “interconnect means” is a means-plus-function limitation subject to 35 U.S.C. § 112 ¶ 6.

d. Recited Functions

On the record before us, Patent Owner does not dispute Petitioner’s proposed functions for this means-plus-function limitation, set forth above.

⁶ The AIA amended 35 U.S.C. § 112, effective March 16, 2013. Because the ’052 patent issued from an application filed before that date, we refer to the pre-AIA version of § 112.

See Prelim. Resp. 9–16. Accordingly, we adopt those undisputed functions for purposes of this Decision. Pet. 10.

e. Corresponding Structure

Patent Owner disputes Petitioner’s proposed corresponding structure for “interconnect means.” Prelim. Resp. 15–16. In particular, Patent Owner disputes Petitioner’s contention that the corresponding structure for the term includes a bus, switch, and point-to-point wire. *Id.* Patent Owner, however, does not dispute Petitioner’s contention that the corresponding structure for the term includes a network. *Id.* at 15–16; *see also id.* at 12 (“[An ordinarily skilled artisan] would understand that the network N and the interconnect means (N) describe the same thing.”).

Patent Owner argues that the ’052 patent distinguishes the interconnect means used in its embodiments from a bus, switch, and a point-to-point wire. Prelim. Resp. 15–16. The Specification supports this argument. The Specification describes that its embodiments relate to systems on a chip with interconnects embodied as networks on a chip:

The following embodiments relate to *systems on chip*, i.e., [.] a plurality of modules on the same chip (including e.g. system in a package, multi-die modules) or on different chips [] [that] communicate with each other via some kind of interconnect. *The interconnect is embodied as a network on chip NOC*, allowing communication between all aforementioned modules.

Ex. 1001, 4:43–48 (emphases added).

The Background section of the Specification distinguishes buses, switches, and point-to-point wires from the interconnects used for these NOC embodiments:

Using networks for on-chip communication when designing systems on chip (SoC), however, raises a number of new issues that must be taken into account. This is because, *in contrast to*

existing on-chip interconnects (e.g., buses, switches, or point-to-point wires), where the communicating modules are directly connected, in a NoC the modules communicate remotely via network nodes.

Ex. 1001, 1:48–54 (emphases added).

The Specification further teaches: “Introducing *networks as on-chip interconnects* radically changes the communication when *compared to direct interconnects, such as buses or switches.*” Ex. 1001, 2:31–34 (emphases added).

The portions of the Specification cited by Petitioner in support of its proposed construction do not provide contrary teachings. First, Petitioner cites to lines 50 through 52 of column 1 of the Specification, which is part of the first disclosure quoted above. Pet. 10. As set forth above, that disclosure teaches that buses, switches, and point wires are not part of the corresponding structure for the interconnect means in the ’052 patent’s embodiments.

Ex. 1001, 4:43–48.

Second Petitioner cites to lines 32 through 42 of column 2, which contains the second quoted disclosure above. Pet. 10. The portion of this disclosure that is not set forth in the quote above is:

This is because of the multi-hop nature of a network, where communication modules are not directly connected, but separated by one or more network nodes. *This is in contrast with the prevalent existing interconnects (i.e., buses) where modules are directly connected.* The implications of this change reside in the arbitration (which must change from centralized to distributed), and in the communication properties (e.g., ordering, or flow control).

Ex. 1001, 2:34–42 (emphasis added). This additional disclosure, which is in the Specification’s Background of the Invention, further teaches that the

structure for the recited interconnects does not include direct connections or buses.

Third, Petitioner cites lines 43 through 50 of column 4 of the '052 patent. The following sentences appear in that disclosure:

The interconnect is embodied as a network on chip NOC, allowing communication between all aforementioned modules. The network on chip may include wires, bus, time-division multiplexing, switches, and/or routers within a network.

Ex. 1001, 4:46–50. This passage indicates that the interconnect can be a network on a chip and the network on a chip can include wires and buses. That does not necessarily mean that the interconnect can be just wires or buses, rather it discloses that the interconnect can include wires and buses. In context, the disclosure regarding wires and buses does not support construing the corresponding structure broadly enough to encompass just wires and buses. The networks that constitute the corresponding structure, however, could include networks with wires and buses.

We further note embodiments in the Description of the Invention that describe networks as the interconnect means. Ex. 1001, 5:7–31, 6:56–64; 7:25–28; 8:9–12, 8:54–58.

In addition, although to date we do not have any district court ruling regarding whether “interconnect means” is a means-plus-function limitation, the district court in the TI litigation addressed whether the construction of “interconnect means” should encompass buses, switches, or point-to-point wires, and held that it should not:

Defendant’s contention that the plain and ordinary meaning of “interconnect means” is “a class of structures that couple the processing modules of an integrated circuit” would be inconsistent with the intrinsic evidence. Docket No. 107 at 33 (citing Docket No. 107-1 at ¶ 135). For example, it would include

the “existing on-chip interconnects (e.g., buses, switches, or point-to-point wires), where the communicating modules are directly connected,” which were described by the patentees as no longer practical. ’818 Patent at 1:31; ’052 Patent at 1:28–29.

Ex. 2022, 51 (emphasis added). On this record, we agree with the district court that the construction of “interconnect means” should not encompass mere buses, switches, or point-to-point wires.

Therefore, on this record, we agree with Patent Owner that the corresponding structure for the interconnect means should not include a mere bus, switch, and point-to-point wire. Thus, on this record, we construe the corresponding structure for the “interconnect means” to be a network, which is undisputed corresponding structure on this record.

Based on Patent Owner’s proposed construction, it seems likely that Patent Owner at trial may advance a narrower definition of the corresponding structure than a network. Prelim. Resp. 9. The TI court determined that the term “interconnect means” should exclude off-chip networks, which lead the district court to accept Patent Owner’s proposed construction of “multi-hop interconnection between modules separated by one or more network nodes.” Ex. 2022, 51. In this proceeding, however, Patent Owner has not proposed that we construe the corresponding structure for “interconnect means” to be narrower than a network. Prelim. Resp. 9–16. Thus, on this record, as mentioned above, we construe the corresponding structure for the “interconnect means” to be a network.

2. Additional Claim Terms

As discussed above, for this Decision, no other claim term requires construction or claim construction analysis. *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019).

III. ANALYSIS OF ASSERTED GROUNDS

A. Ground 1: Asserted Anticipation by Rădulescu2004

Petitioner asserts that Rădulescu2004 anticipates claims 1, 2, and 5–7.

Pet. 3.

1. Rădulescu2004

Rădulescu2004 describes a network interface (NI) for an on-chip network. Ex. 1005, 1, Abstract. Rădulescu2004 describes that it split the design of its network interface in two parts as shown in Figure 1 below:

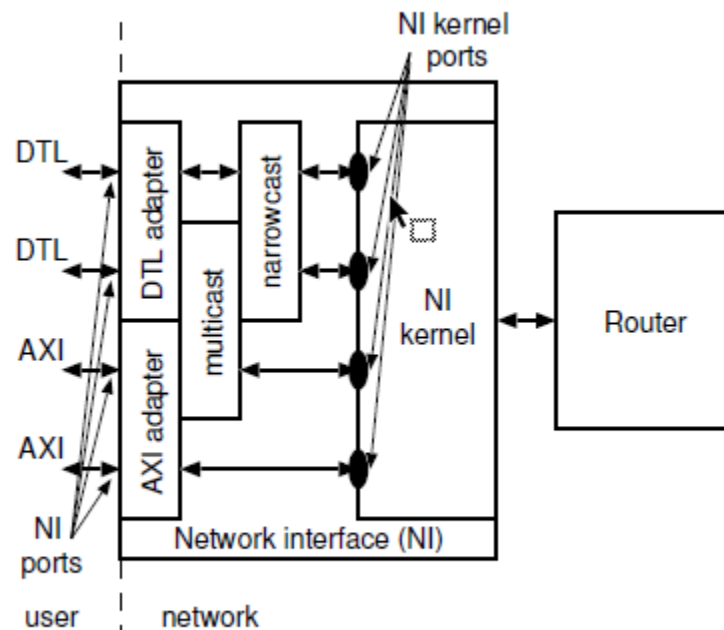


Figure 1. NI kernel and shells

Ex. 1005, 3. Figure 1 above shows (a) an NI kernel, which implements the channels, packetizes messages and schedules them to the routers, implements the end-to-end flow control, and the clock domain crossing, and (b) the NI shells, which implement the connections (e.g., narrowcast, multicast), transaction ordering for connections, and other higher-level issues specific to the protocol offered to the IP. Ex. 1005, 3. The NI kernel communicates with the NI shells via ports. *Id.* at 4. Although the NI kernel can implement

point-to-point connections, the NI shells implement more complex transactions, such as narrowcast or multicast connections. *Id.*

Rădulescu2004 explains that messages can be mapped to connections by use of “connid” signals. Specifically, when a port has “multiple connections to allow differentiated traffic classes,” connid signals are used to “select on which connection a message is supplied or consumed.” Ex. 1005, 3. Figure 3 of Rădulescu2004 is shown below:

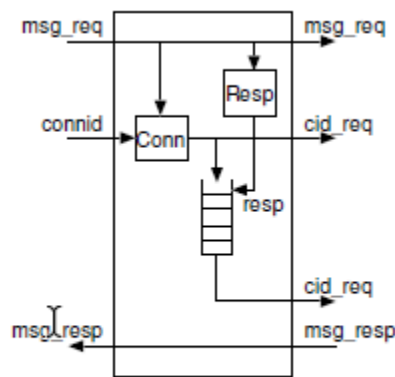


Figure 3. Narrowcast shell

Ex. 1005, 4. Figure 3 above shows an example of a narrowcast shell. *Id.*

Figure 8 of Rădulescu2004 is shown below:

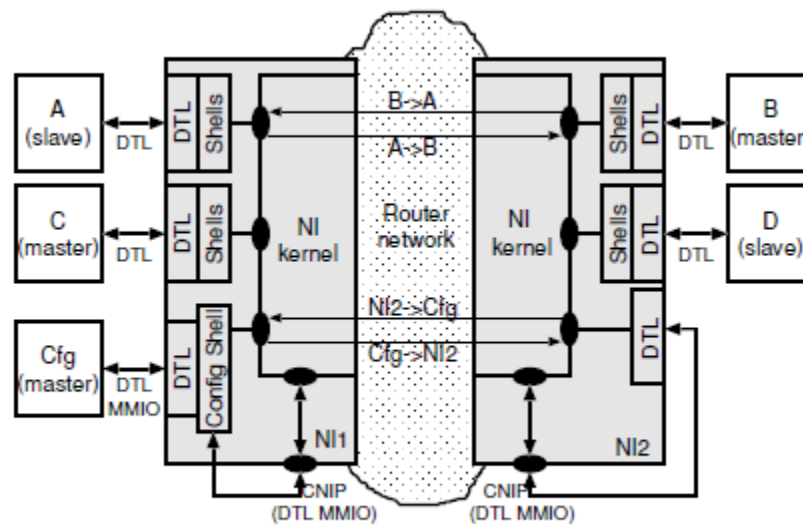


Figure 8. NI configuration

Ex. 1005, 5. Figure 8 above shows a network interface configuration. *Id.*
Rădulescu2004 explains that with this embodiment:

Configuration is performed using the NoC itself (i.e., there is no separate control interconnect needed for NoC configuration). Consequently, the CNIPs [configuration ports for network interfaces] are connected to the NoC like any other slave (see CNIP at NI2 in Figure 8). At the configuration module *Cfg*'s NI, we introduce a configuration shell (*Config Shell*), which, based on the address configures the local NI (NI1), or sends configuration messages via the NoC to other NIs. The configuration shell optimizes away the need for an extra data port at NI1 to be connected to the NI1's CNIP.

Id.

2. Claim 6

For ease of discussion, we begin with claim 6.

a. [6.pre.1] Method of communication service mapping in an integrated circuit, having a plurality of processing modules (M, S)

Petitioner argues that Rădulescu2004 “present[s] a network interface for an on-chip network” (i.e., a NoC) and states that its network interface “is

intended for systems on chip (SoC).” Pet. 21. Further, Petitioner asserts that an ordinarily skilled artisan would have understood that SoCs are integrated circuits, and that Rădulescu2004’s “on chip network” and the components that interface therewith are implemented on the same integrated circuit. *Id.* Petitioner also argues that Rădulescu2004 discloses communication service mapping. *Id.* Further, Petitioner asserts that Rădulescu2004 “discloses a plurality of processing modules in the form of ‘IP modules,’ which Rădulescu2004—like the ’052 patent—calls ‘masters’ and ‘slaves.’” *Id.*

Patent Owner argues that Rădulescu2004 does not disclose the recited communication service mapping. Prelim. Resp. 47–50. Patent Owner asserts that, instead, Rădulescu2004 discloses a fixed hardware configuration between modules and network interfaces that is required to be set up before receiving service requests during an operational stage, i.e., prior to mapping communication service requests. *Id.* at 47. Patent Owner argues that the recited mapping communication service requests excludes such a hardware configuration. *Id.* at 48.

We disagree with this argument by Patent Owner. The plain language of the term provides no such exclusion. Ex. 1001, 10:7–32. Patent Owner cites nothing from the Specification that defines communication service requests to have such an exclusion. Prelim. Resp. 47–50. Although Patent Owner cites lines 7–26 of column 8 of the ’052 patent, that disclosure does not provide a definition for communication service requests that excludes a fixed hardware configuration. Prelim Resp. 49; Ex. 1001, 8:7–26.

Further, during prosecution of the '052 patent, the Applicant⁷ attempted to distinguish an earlier version of issued claim 6 that recited “communication service mapping” from the cited references Dielissen⁸ and Rădulescu2000.⁹ Ex. 1002, 106, 110. The applicant argued that claim 6 was distinguishable because Dielissen and Rădulescu2000 had a fixed hardware configuration. *Id.* at 110. The Examiner found the Applicant’s argument to be unpersuasive, and maintained the rejection of claim 6 and the other pending claims. *Id.* at 119, 122. The Examiner indicated that the distinction the Applicant was raising was not recited in the claims:

In response to applicant’s argument that the references fail to show certain features of applicant’s invention (See Page 6), it is noted that the features upon which applicant relies (i.e., that the identification means in the existing protocols are: communication threads and addresses, and that the threads or addresses are mapped to connections through the interconnect based on specific connection properties) are not recited in the rejected claim(s).

Id. at 122–23. It was not until the Applicant added the communication thread/address range limitation to the pending claims that the Examiner allowed claim 6 and the other pending application claims to issue. *Id.* at 140, 143.

In sum, we disagree with Patent Owner’s argument regarding communication service mapping. After reviewing the record, we determine

⁷ The '052 patent identifies its assignee at issuance as Koninklijke Philips Electronics N.V. Ex. 1001, code (73).

⁸ J. Dielissen, et al. “*Concepts and Implementation of the Philips Network-on-Chip*,” Philips Research Laboratories, Eindhoven, The Netherlands (2003) (Ex. 1011) (“Dielissen”).

⁹ A. Rădulescu, et al. “*Communication Services for Networks on Chip*,” Philips Research Laboratories, Eindhoven, The Netherlands, SAMOS, II(), 275–99 (2002) (“Rădulescu2000”).

that Petitioner has made a sufficient showing regarding preamble recitation 6.pre.1.

b. *[6.pre.2] wherein at least one first of said processing modules (M) requests at least one communication service to at least one second processing module (S) based on specific communication properties and at least one communication service identification, wherein said at least one communication service identification comprises at least one communication thread or at least one address range, said address range for identifying one or more second processing modules (S) or a memory region within said one or more second processing modules (S)*

Petitioner argues that Rădulescu2004 discloses a “master (a *first processing module (M)*) requesting a *communication service* to a slave (a *second processing module (S)*).” Pet. 22. Further, Petitioner asserts that the request messages include read and write commands. *Id.* Petitioner argues that the requested read and write operations are based on specific communication properties. *Id.* at 23. Petitioner asserts that Rădulescu2004 describes differentiated services and differentiated traffic classes. *Id.* Petitioner further asserts that “a first processing module (the master) requests a communication service to a second processing module (the slave) based on a *communication service identification* as claimed.” *Id.* at 24. Petitioner argues that “the requests in Rădulescu2004 include an address that identifies a slave and/or a memory within the slave.” *Id.* Petitioner further argues that “each slave identified by an address has an address range.” *Id.* Petitioner quotes the following disclosure from Rădulescu2004:

We implement the narrowcast connection as a collection of point-to-point connections, one for each master-slave pair. Within a narrowcast connection, *the slave for which the transaction is destined is selected based on the address* (Conn

block). *The address range assigned to a slave is configurable in the narrowcast module.*

Pet. 24 (quoting Ex. 1005, 4, emphasis by Petitioner). Petitioner argues that “[t]hus, the requests for communication services (read/write operations) made by the Master IP module include a communication service identification corresponding to ‘at least one address range’ that ‘identif[ies] one or more second processing modules (S) or a memory region within said one or more second processing modules (S).’” *Id.* at 25.

Patent Owner argues that Rădulescu2004 does not teach or suggest preamble recitation 6.pre.2. Prelim. Resp. 51–52. Patent Owner argues that, although Petitioner may have established that Rădulescu2004 discloses that (i) its communication service identification contains an address for the “slave” and (ii) its “slave” has an address range, those two disclosures do not mean that the communication service identification has an address range. *Id.* Patent Owner asserts that it merely means that the communication service identification has an address, and the “slave” has an address range. *Id.*

We agree with Patent Owner that Rădulescu2004’s disclosures that its communication service identification contains an address for the “slave” and its “slave” has an address range do not by themselves teach or suggest that Rădulescu2004’s communication service identification contains an address range. Further, Petitioner has not explained why other disclosures or the knowledge of an ordinarily skilled artisan would have provided such a teaching or suggestion. Thus, we determine that Petitioner’s showing for preamble recitation 6.pre.2 is insufficient.

No party has argued that the address range recitation in preamble recitation 6.pre.2 is not a limitation of claim 6. Further, on this record, we determine that it is a limitation of claim 6. The address range recitation of

claim 6 was added to obtain the allowance of the application during patent prosecution. Ex. 1002, 138, 140, 144; *see, e.g., Catalina Mktg. Int'l v. Coolsavings.com*, 289 F.3d 801, 808–09 (Fed. Cir. 2002) (“[C]lear reliance on the preamble during prosecution to distinguish the claimed invention from the prior art transforms the preamble into a claim limitation because such reliance indicates use of the preamble to define, in part, the claimed invention.”). In particular, the address range recitation of claim 6 was included as part of the following “thread/address range limitation” added to claim 6 to distinguish cited prior art: “wherein said at least one communication service identification comprises at least one communication thread or at least one address range, said address range for identifying one or more second processing modules (S) or a memory region within said one or more second processing modules (S).” Ex. 1002, 138. The thread/address range limitation was also added to the other pending independent application claims: 1 and 7. *Id.* at 138–139. Thus, for this Decision, we construe the thread/address range recitation to be a limitation of claim 6.

We nevertheless continue to analyze Petitioner’s showing for preamble recitation 6.pre.2 and for Ground 1 as a whole because, for Ground 2, Petitioner, in part, relies on its showing for Ground 1.

Continuing with our analysis of recitation 6.pre.2, Patent Owner provides another reason why Rădulescu2004 purportedly does not teach or suggest preamble recitation 6.pre.2. Patent Owner argues that Rădulescu2004 has a fixed hardware configuration between modules and network interfaces that is required to be set up prior to receiving service requests during an operational stage, i.e., prior to mapping communication service requests. Prelim. Resp. 52. Patent Owner asserts that the transaction requests in Rădulescu2004 and any addresses associated therewith come after

the configuration between modules and network interfaces has already been set up. *Id.* Patent Owner argues that, therefore, the address associated with a transaction request in Rădulescu2004 cannot be the “address range” of a communication service identification on which the communication service is based as required in claim 6 of the ’052 patent. *Id.*

On the current record, Patent Owner’s arguments regarding Rădulescu2004’s purportedly fixed hardware configuration are not persuasive because recitation 6.pre.2 does not recite any language that excludes a fixed hardware configuration. Further, during prosecution of the ’052 patent, the Examiner essentially rejected these arguments for an earlier version of claim 6. Ex. 1002, 119, 122–123. In particular, the Applicant attempted to distinguish the then-pending application claims from the cited references Dielissen and Rădulescu2000 on the grounds that those references had a fixed hardware configuration. *Id.* at 110. The Examiner was not persuaded by the Applicant’s argument and maintained the rejection of claim 6 and the other pending claims. *Id.* at 119, 122–123. It was not until the Applicant added the communication thread/address range limitation to the pending claims that the Examiner allowed claim 6 and the other pending claims to issue. *Id.* at 140, 143.

In sum, after reviewing the record, Petitioner has not made a sufficient showing regarding the thread/address range limitation of preamble recitation 6.pre.2.

*c. [6.a] coupling said plurality of processing modules
(M, S) by an interconnect means (N)*

Petitioner maps the recited processing modules to Rădulescu2004’s “master” and “slave” IP modules. Pet. 25. Petitioner maps the recited interconnect means to Rădulescu2004’s router network. *Id.* at 25–26.

Further, Petitioner argues that Rădulescu2004's router network couples Rădulescu2004's "master" and "slave" IP modules. *Id.* Petitioner argues that to the extent Patent Owner advocates a construction of "interconnect means" as "a multi-hop interconnection between modules separated by one or more network nodes," an ordinarily skilled artisan would have understood that Rădulescu2004 discloses such an interconnect means. *Id.* at 26.

According to Petitioner, Rădulescu2004's routers are "network nodes" and an ordinarily skilled artisan would have understood that the need for a packet to traverse one or more of such routers from its source to its destination includes a "multi-hop interconnection between modules separated by one or more network nodes." *Id.* at 26–27.

Patent Owner provides no counterarguments regarding limitation 6.a. Prelim. Resp. 45–52. After reviewing the record, we determine that Petitioner has made a sufficient showing for limitation 6.a.

*d. [6.b] enabling a connection based communication
having a set of connection properties*

Petitioner argues that Rădulescu2004 teaches limitation 6.b by describing that its router network "provide[s] transport layer services by defining connections . . . configured for specific properties (e.g., throughput, ordering)." Pet. 27 (quoting Ex. 1005, 1) (emphasis omitted). Patent Owner provides no counterarguments regarding limitation 6.b. Prelim. Resp. 45–52. After reviewing the record, we determine that Petitioner has made a sufficient showing for limitation 6.b.

e. [6.c] controlling the communication between said at least one first of said plurality of processing modules (M) and said interconnect means (N) by at least one network interface (NI) associated to said at least one first of said processing modules

Petitioner argues that Rădulescu2004 describes that “network interfaces (NI), [] implement the interface to the IP modules.” Pet. 28 (quoting Ex. 1005, 1) (emphasis omitted). Further, Petitioner asserts that Rădulescu2004 explains that this “network interface has a modular design, composed of kernel and shells” where the NI kernel “provides the basic functionality, including arbitration between channels,” and the NI shells “implement (a) additional functionality, such as multicast and narrowcast connections, and (b) adapters to existing protocols, such as AXI or DTL.” *Id.* at 29–30 (quoting Ex. 1005, 6). According to Petitioner, an ordinarily skilled artisan would have understood from these disclosures that the network interface (NI) controls the communication between the IP modules (including a first master module) and the interconnect means (e.g., the router network). *Id.* at 30. Patent Owner provides no counterarguments regarding limitation 6.c. Prelim. Resp. 45–52. After reviewing the record, we determine that Petitioner has made a sufficient showing for limitation 6.c.

f. [6.d.] mapping the requested at least one communication service based on said specific communication properties to a connection based on a set of connection properties according to said at least one communication service identification.

Petitioner argues that Rădulescu2004 discloses requests for communication services that are based on specific communication properties, connections with specific connection properties, and a communication service identification in the form an address range. Pet. 30. Further,

Petitioner argues that Rădulescu2004 discloses mapping the requests to the connections according to the communication service identification. *Id.*

Petitioner further asserts that “Rădulescu2004 describes that its NoC provides ‘narrowcast connections’ between a single master and multiple slaves and explains that such connections are implemented as ‘a collection of point-to-point connections, one for each master-slave pair.’” *Id.* Further, Petitioner argues that a communication service request is mapped to a particular one of these point-to-point connections based on the address provided in the request. Petitioner quotes the following disclosure in Rădulescu2004: “Within a narrowcast connection, the slave for which the transaction is destined is selected based on the address (Conn block). The address range assigned to a slave is configurable in the narrowcast module.” *Id.* at 31 (emphasis omitted) (quoting Ex. 1005, 4).

Patent Owner argues that Rădulescu2004 does not disclose communication service mapping as recited in claim 6 of the ’052 patent, but discloses a fixed hardware configuration between modules and network interfaces that is required to be set up prior to receiving service requests during an operational stage, i.e., prior to mapping communication service requests. Prelim. Resp. 52. As set forth in Section III.A.2.b above, we disagree with Patent Owner’s argument that claim 6 distinguishes a fixed hardware configuration. After reviewing the record, we determine that Petitioner has made a sufficient showing for limitation 6.d.

g. Summary

In sum, on this record, Petitioner has not made a sufficient showing for preamble recitation 6.pre.2, which we preliminarily determine constitutes a limitation. Thus, Petitioner has not established a reasonable likelihood of proving that Rădulescu2004 anticipates claim 6.

3. Claims 1 and 7

Limitations 1.f and 7.c each recite the same communication thread/address range limitation as in preamble recitation 6.pre.2. *See* Section I.C above. For these limitations, Petitioner relies on its showing for preamble recitation 6.pre.2. Pet. 33. Thus, for the reasons discussed above for claim 6, Petitioner also has not established a reasonable likelihood of proving that Rădulescu2004 anticipates claims 1 and 7.

4. Claims 2 and 5

Claims 2 and 5 each depend from claim 1. Ex. 1001, 9:51–10:6. For the reasons discussed above for claim 1, Petitioner has not established a reasonable likelihood of proving that Rădulescu2004 anticipates claims 2 and 5.

B. Ground 2: Asserted Obviousness over Rădulescu2004 and OCP

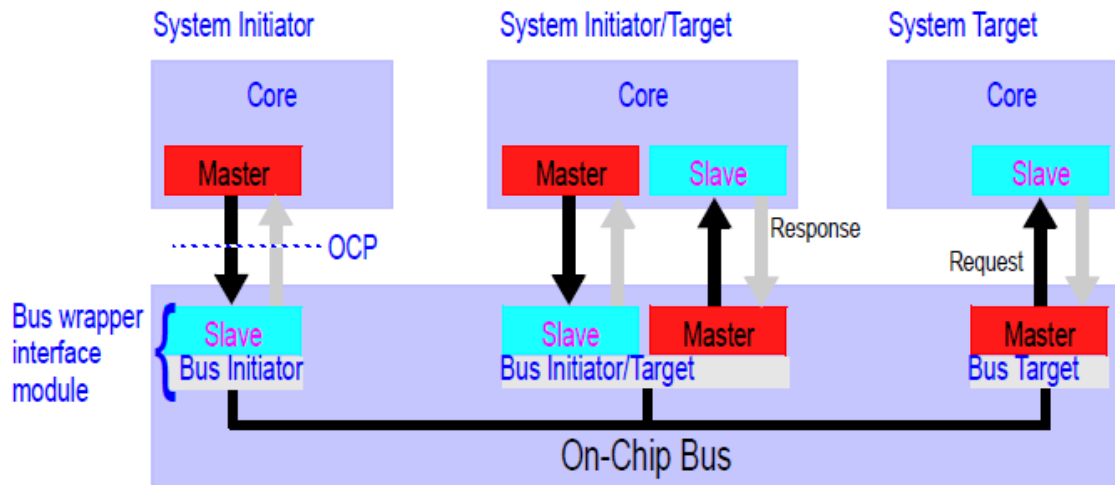
Petitioner argues that claims 1–7 would have been obvious over the combination of Rădulescu2004 and OCP. Pet. 3.

1. OCP

OCP (Open Core Protocol) “addresses communications between the functional units (or IP cores) that comprise a system on a chip.” Ex. 1006,

19. OCP states that “[a]ny on-chip interconnect can be interfaced to the OCP.” *Id.* at 11. Figure 1 of OCP is below:

Figure 1 System Showing Wrapped Bus and OCP Instances



Id. at 14. Figure 1 above “shows a simple system containing a wrapped bus and three IP core entities: one that is a system target, one that is a system initiator, and an entity that is both.” *Id.* “The characteristics of the IP core determine whether the core needs master, slave, or both sides of the OCP; the wrapper interface modules must act as the complementary side of the OCP for each connected entity.” *Id.*

Regarding signal groups, OCP explains that some OCP fields are grouped together because they must be active at the same time. The data flow signals are divided into three signal groups: request signals, response

signals, and datahandshake signals. Ex. 1006, 38. Table 12 of OCP is below:

Table 12 OCP Signal Groups

Group	Signal	Condition
Request	MAddr	always
	MAddrSpace	always
	MBurst	always
	MByteEn	always
	MCmd	always
	MConnID	always
	MData*	datahandshake = 0
	MThreadID	always
Response	SData	always
	SResp	always
	SThreadID	always
Datahandshake	MData*	datahandshake = 1
	MDataValid	always
	MDataThreadID	always

*MData belongs to the request group, unless the datahandshake configuration parameter is enabled. In that case it belongs to the datahandshake group.

Id. Table 12 above provides a list of signals belonging to each signal group.
Id.

2. Asserted Motivation to Combine Rădulescu2004 and OCP

Petitioner argues that an ordinarily skilled artisan would have been motivated to combine the teachings of Rădulescu2004 with those of the OCP because Rădulescu2004 expressly describes that its method and system is designed and intended to be compatible with the OCP protocol. Pet. 37. Petitioner asserts that Rădulescu2004 describes that its system was designed “to provide backward compatibility to existing on-chip communication

protocols,” and specifically identifies “OCP” as one of three such protocols. *Id.*

Petitioner asserts that an ordinarily skilled artisan would have been motivated to look to OCP’s disclosure for the format and content of request messages that would be sent by system initiator modules to these adapters. Pet. 38. Petitioner argues that one of the Request signals is “MThreadID,” which “provides the thread identifier associated with the current transfer request.” *Id.* Further, Petitioner asserts that OCP describes numerous advantages of employing threads, including “support[ing] many different burst styles,” “support[ing] concurrent activity, and out-of-order completion of transfers,” and “enabl[ing] busy targets . . . to prioritize requests.” *Id.* (quoting Ex. 1006, 46, 181). Petitioner argues that Rădulescu2004 also teaches the advantages of using connection properties to improve performance of data transfer in an interconnection. *Id.* Petitioner further argues that an ordinarily skilled artisan would have reasonably expected the proposed combination of Rădulescu2004’s and OCP’s teachings to succeed. *Id.* at 39.

Patent Owner provides no counterarguments regarding the asserted motivation to combine or reasonable expectation of success for combining Rădulescu2004’s and OCP’s teachings. Prelim. Resp. 53–54. After reviewing the record, we determine that Petitioner has set forth a sufficient showing for combining Rădulescu2004’s and OCP’s teachings.

3. Claim 6

For claim 6, Petitioner relies principally on its showing for Ground 1. *See* Pet. 39–44. In addition, however, Petitioner provides further arguments for certain limitations of claim 6 in the event its showing for those limitations for Ground 1 is determined to be insufficient. *Id.* at 36. As set forth in

Section III.A.2 above, we determined that Petitioner’s showing for Ground 1 for all limitations of claim 6 is sufficient with the exception of Petitioner’s showing for preamble recitation 6.pre.2.

For preamble recitation 6.pre.2, Petitioner argues that OCP discloses communication service requests based on communication service identifiers that include both a thread and an address range. Pet. 41. Petitioner asserts that, as shown in OCP’s Table 12, the signals used when a system initiator makes a request for such a service from a system initiator target an address range (“MAddr,” “MAddrSpace”) and a thread ID (“MThreadID”). *Id.* at 41–42. Petitioner contends that an ordinarily skilled artisan “would have understood that MAddr and MAddrSpace identify a system target (i.e., second processing module) and/or a memory region within the system target.” *Id.* at 42. Petitioner further argues that an ordinarily skilled artisan would have been motivated to implement the OCP protocol in the system of Rădulescu2004, including its threads and address range teachings, as Rădulescu2004 expressly identifies OCP as one of the existing protocols with which its NOC is compatible, and would have had a reasonable expectation of success. *Id.*

Patent Owner presents no counterarguments to the arguments from Petitioner set forth in the preceding paragraph. Prelim. Resp. 53–54. Patent Owner argues, however, that “OCP does not cure the fundamental deficiency that Rădulescu2004 does not disclose a communication service mapping because it discloses a fixed hardware configuration between modules and network interfaces that is *required to be set up prior to receiving service requests* during an operational stage.” *Id.* As set forth in Section III.A.2.b above, however, we disagree with Patent Owner’s fixed-hardware-configuration argument.

After reviewing the record, we determine that Petitioner provides a sufficient showing for preamble recitation 6.pre.2. Accordingly, we determine that Petitioner has established a reasonable likelihood of proving that claim 6 would have been obvious over the combination of Rădulescu2004 and OCP.

4. Claims 1 and 7

For claims 1 and 7, Petitioner relies on its showing for claim 6 for Ground 2 and its showings for claims 1, 6, and 7 for Ground 1. Pet. 45–46; *see also id.* at 39–44. For Ground 1, Petitioner sets forth how it contends Rădulescu2004 discloses the differences between claims 1 and 7 and claim 6. *Id.* at 32–36. Patent Owner presents no counterarguments for Grounds 1 and 2 that are specific to claims 1 and 7. Prelim. Resp. 53–54.

As set forth in Section III.A.2 above, we determined that Petitioner’s showing for all limitations for Ground 1 for claim 6 are sufficient, except for the communication thread/address range limitation in preamble recitation 6.pre.2. Further, as set forth in Section III.B.3 above, we determined Petitioner’s showing for the communication thread/address range limitation for Ground 2 is sufficient. After reviewing the record, we determine that Petitioner has demonstrated a reasonable likelihood of proving that claims 1 and 7 would have been obvious over the combination of Rădulescu2004 and OCP.

5. Claims 2 and 5

For Ground 1, Petitioner sets forth how it contends that Rădulescu2004 discloses the limitations that claims 2 and 5 add to claim 1. Pet. 36. For Ground 2, for claims 2 and 5, Petitioner relies on its showing for Ground 1 that Rădulescu2004 discloses the limitations that claims 2 and 5 add to claim 1. *Id.* at 46–47. Patent Owner has not set forth any counterarguments

regarding the limitations that claims 2 and 5 add to claim 1. Prelim.

Resp. 53–54. After reviewing the record, we determine that Petitioner has demonstrated a reasonable likelihood of proving that claims 2 and 5 would have been obvious over the combination of Rădulescu2004 and OCP.

6. Claims 3 and 4

Petitioner sets forth the reasons it contends that the limitation claim 3 adds to claim 1 and the limitations that claim 4 adds to claim 3 are suggested by the combination of Rădulescu2004 and OCP. Pet. 46–47. Patent Owner has not set forth any counterarguments regarding the limitation claim 3 adds to claim 1 or the limitations that claim 4 adds to claim 3. Prelim.

Resp. 53–54. After reviewing the record, we determine that Petitioner has demonstrated a reasonable likelihood of proving that claims 3 and 4 would have been obvious over the combination of Rădulescu2004 and OCP.

C. Ground 3: Asserted Anticipation by Weber

Petitioner argues that Weber anticipates claims 1–7. Pet. 3.

1. Weber

Weber is directed to a communication system to couple computing sub-systems. Ex. 1007 ¶ 1. Weber describes a communications system and method for allowing multiple functional blocks or sub-systems of a complex electronics system to communicate with each other through a shared communications bus. *Id.* ¶ 35. In one embodiment, a communications protocol allows multiple functional blocks on a single semiconductor device to communicate to each other. *Id.* In another embodiment, the communications protocol may be used to allow multiple functional blocks on different semiconductor devices to communicate to each other through a shared off-chip communications resource, such as a bus. *Id.*

Figure 1 of Weber is shown below:

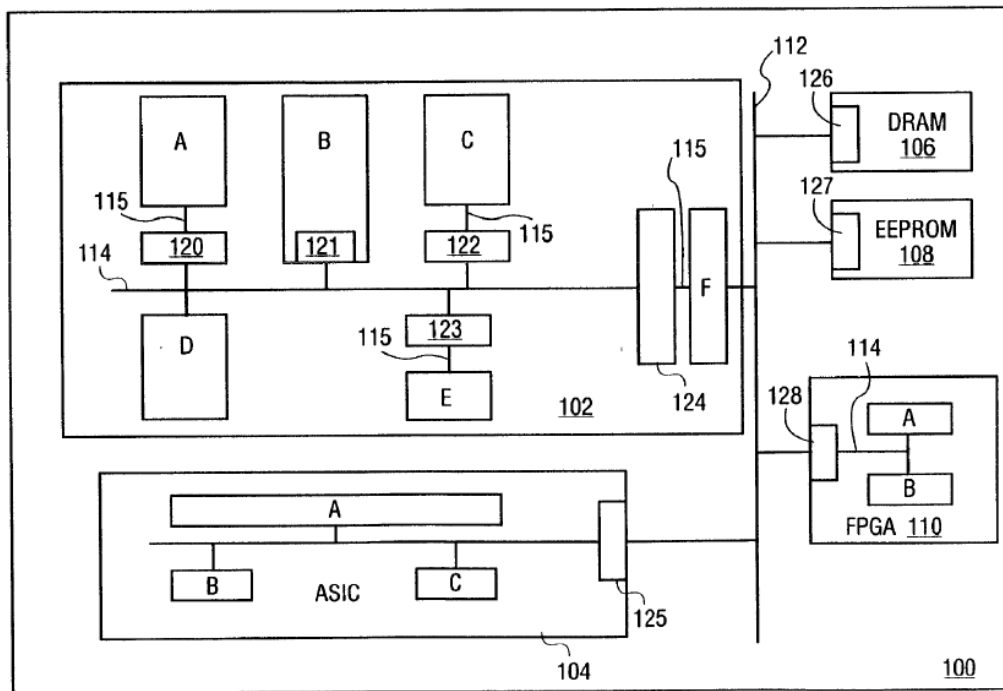


FIG. 1

Figure 1 above is a block diagram of complex electronics system 100. *Id.*

¶ 37. “Shared communications bus 112 connects subsystems 102, 104, 106, 108, and 110.” *Id.* “Subsystems are typically functional blocks including a[n] interface module for interfacing to a shared bus.” *Id.* “Sub-systems may themselves include one or more functional blocks and may or may not include an integrated or physically separate interface module.” *Id.* “In one embodiment, the sub-systems connected by communications bus 112 are separate integrated circuit chips.” *Id.*

Figure 11 of Weber is shown below:

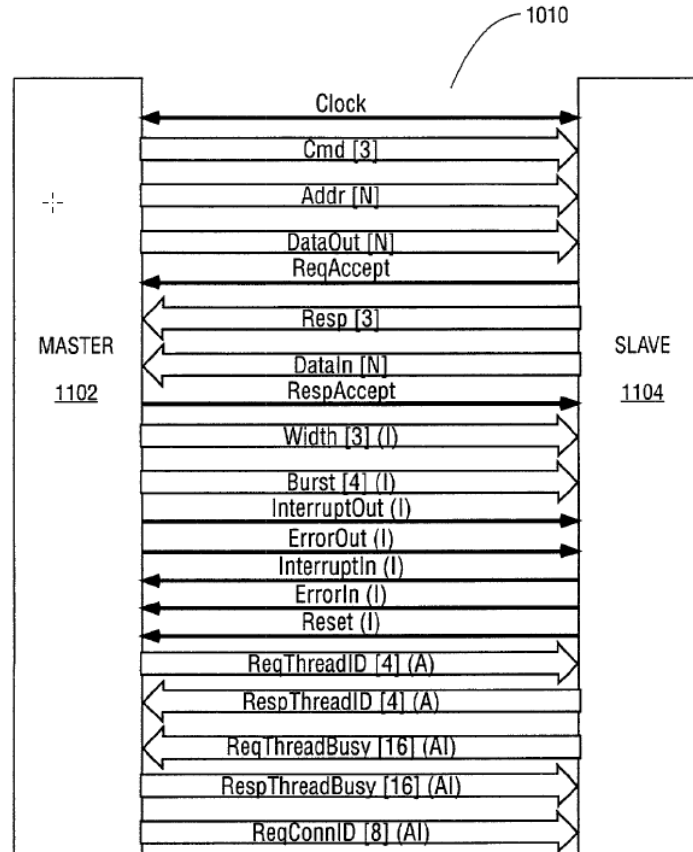


FIG. 11

Figure 11 shows interconnect 1010, which is a point-to-point interconnect “between master entity 1102 and slave entity 1104.” *Id.* ¶ 74. Signals shown in Figure 11 are labeled with signal names. *Id.* ¶ 75. One signal shown is Request Thread Identifier (ReqThreadID), which is “a four-bit signal that provides the thread number associated with a current transaction intended for slave 1104.” *Id.* ¶ 85.

2. Claim 6

For ease of discussion, we begin with claim 6 and focus on only the disputed issues for this claim.

a. [6.pre.1] Method of communication service mapping in an integrated circuit, having a plurality of processing modules (M, S)

Petitioner sets forth its contentions as to how Weber discloses recitation 6.pre.1. Pet. 47–49. Patent Owner provides no counterarguments for this recitation. Prelim. Resp. 54–65. After reviewing the record, we determine that Petitioner has made a sufficient showing for recitation 6.pre.1.

b. [6.pre.2] wherein at least one first of said processing modules (M) requests at least one communication service to at least one second processing module (S) based on specific communication properties and at least one communication service identification, wherein said at least one communication service identification comprises at least one communication thread or at least one address range, said address range for identifying one or more second processing modules (S) or a memory region within said one or more second processing modules (S)

The disputed issues for this recitation are whether Weber discloses (i) the recited communication thread and (ii) the recited address range. Prelim. Resp. 54–58. Petitioner argues that Weber discloses that its communication service requests include “thread identification information.” Pet. 52. Petitioner asserts that the recited thread identification information is also referred to as a Thread ID. *Id.* Further, Petitioner asserts that Figure 11 of Weber shows a Thread ID signal. Petitioner argues that at least Weber’s ReqThreadID is the recited communication thread. *Id.* at 52–53.

Patent Owner argues that Weber’s ReqThreadID is not the recited communication service identification because, in the ’052 patent, the recited communication service identification is used to identify traffic classes of a communication. Prelim. Resp. 54–55. Patent Owner argues that Weber’s ReqThreadID identifies a transfer, rather than a traffic class. *Id.* at 55. We

are not persuaded by this argument by Patent Owner because claim 6 does not have any recitation limiting the recited communication service identification to that which identifies a traffic class. Patent Owner merely cites to an example in the Specification where a communication service identification is used to identify a traffic class, rather than a definition that would so limit the term. Prelim. Resp. 54–55 (citing Ex. 1001, 7:44–54). The passage cited by Patent Owner begins: “Where communication threads are used to identify traffic classes” Ex. 1001, 7:44–46. Therefore, this passage does not indicate that all communication threads must identify traffic classes. Accordingly, on this record, we determine that Petitioner has sufficiently shown that Weber discloses the recited communication thread.

Patent Owner argues that Weber does not disclose the recited address range. Prelim. Resp. 55–58. On this record, this argument by Patent Owner has merit, as Petitioner’s evidence that Weber’s communication identification has the recited address range appears insufficient. Pet. 52–54. For example, Petitioner’s proffered expert, Dr. Hassoun, testifies that Weber discloses the capability of issuing a request based on an address range. Ex. 1003 ¶ 193. Dr. Hassoun also testifies that that Weber discloses an address base, which indicates that the address has a range of addresses that starts at the base. *Id.* Further, Dr. Hassoun testifies that this means that Weber’s address request is based on an address range. *Id.* Even if we accept this testimony as true, it still would not establish that the communication identification itself includes an address range.

Preamble recitation 6.pre.2, however, does not require that the communication service identification include *both* the recited communication thread and an address range. *See* Section I.C. above. Instead, the recitation requires that the communication service identification include a thread or an

address range. *Id.* Petitioner has made a sufficient showing for the recited communication thread. Pet. 52–54. Patent Owner’s argument to the contrary is based on its contention that the recited communication service identification is limited to traffic classes. Prelim. Resp. 54–55. (The recited communication thread, when it is present, is part of the recited communication service identification: “at least one communication service identification comprises at least one communication thread.” *See* Section I.C. above.) As set forth above, we disagree with Patent Owner’s argument that the recited communication service identification is limited to traffic classes.

After reviewing the record, we determine that Petitioner has made a sufficient showing for preamble recitation 6.pre.2.

*c. [6.a] coupling said plurality of processing modules
(M, S) by an interconnect means (N)*

The disputed issue for this limitation is whether Weber discloses “an interconnect means.” Prelim. Resp. 58–64. Patent Owner does not dispute that if we were to adopt Petitioner’s proposed construction for “interconnect means,” Weber would disclose the recited interconnect means. *Id.* Patent Owner, however, does dispute whether Weber would disclose the recited interconnect means if we were to adopt Patent Owner’s proposed construction for that term. *Id.* We, however, did not adopt either party’s proposed construction for interconnect means. *See* Section II.B.1 above. Further, we preliminarily construed “interconnect means” to be a means-plus-function limitation and determined that its corresponding structure is a network. *Id.* Neither party, however, has addressed whether what Petitioner identifies as an interconnect means in Weber is a network. Pet. 54–58; Prelim. Resp. 58–64. We do not need to consider the issue *sua sponte*

because its resolution would not affect our decision to institute a trial. Further, we would prefer to resolve the issue with the benefit of specific briefing from the parties.

Because our preliminary construction does not resolve the issue of whether Weber discloses the recited interconnect means, we cannot determine whether Petitioner’s showing regarding limitation 6.a is sufficient.

To the extent that Patent Owner’s proposed construction remains relevant at trial or is included in the proposed structure of a means-plus-function construction of interconnect means, further discussion and evidence of what a “hop” entails and whether the cited portions of Weber disclose the requisite hops would be helpful.

d. Limitations 6.b–6.d

The disputed issues for limitations 6.b–6.d are the same as for preamble recitation 6.pre.2 and limitation 6.a. Prelim. Resp. 64–65.

e. Summary

In sum, we have not determined whether Petitioner has established a reasonable likelihood of proving that Weber anticipates claim 6. Additional briefing from the parties on this issue would be helpful.

3. Claims 1–5 and 7

For claims 1–5 and 7, Petitioner relies on its showing for claim 6. Pet. 65–66. Thus, we cannot determine whether Petitioner has established a reasonable likelihood of proving that Weber anticipates claims 1–5 and 7. As mentioned, additional briefing from the parties regarding Petitioner’s showing for claim 6 would be helpful.

D. Ground 4: Asserted Obviousness over Weber and Rădulescu2004

Petitioner asserts that claims 1–7 would have been obvious over the combination of Weber and Rădulescu2004. Pet. 4.

Petitioner argues that an ordinarily skilled artisan would have been motivated to combine Weber’s and Rădulescu2004’s teachings and would have had a reasonable expectation of success in so doing. Pet. 68–71. Petitioner asserts that, in particular, an ordinarily skilled artisan would have combined Rădulescu2004’s teachings regarding interconnections with Weber’s teachings. *Id.*

Patent Owner does not challenge Petitioner’s contention that an ordinarily skilled artisan would have been motivated to make this combination or would have had a reasonable expectation of success in so doing. Prelim. Resp. 65. Patent Owner merely argues that the combination would not cure the deficiencies of either Weber or Rădulescu2004. *Id.*

On this record, we disagree. For Ground 3, the potential deficiency in Weber is its disclosure of an interconnect means. *See* Section III.C above. Rădulescu2004’s disclosure of an interconnect means was not disputed. Prelim. Resp. 46–52. Thus, adding Rădulescu2004’s interconnect means to Weber would overcome the potential deficiency in Weber. Accordingly, we determine that, with this combination, Petitioner has established a reasonable likelihood of proving that claim 6 would have been obvious over the combination of Weber and Rădulescu2004.

The disputed issues for claims 1–5 and 7 are the same as for claim 6. Prelim. Resp. 65. Accordingly, we determine that Petitioner has established a reasonable likelihood of proving that claims 1–5 and 7 would have been obvious over the combination of Weber and Rădulescu2004.

IV. DISCRETIONARY DENIAL UNDER 35 U.S.C. § 325(d)

Patent Owner contends we should deny institution under 35 U.S.C. § 325(d), arguing that Petitioner relies “on the same or substantially the same prior art and arguments here as were presented to the Office during the

prosecution of the patents.” Prelim. Resp. 40; Prelim. Sur-reply 3–5.
Petitioner disagrees. Pet. 76; Prelim. Reply 3–5.

A. 35 U.S.C. § 325(d)

Section 325(d) provides that the Director may elect not to institute a trial if the petition challenges a patent based on matters previously presented to the Office: “In determining whether to institute or order a proceeding under this chapter, chapter 30, or chapter 31, the Director may take into account whether, and reject the petition or request because, the same or substantially the same prior art or arguments previously were presented to the Office.” 35 U.S.C. § 325(d).

The Board has set forth a two-part framework for this determination under § 325(d):

(1) whether the same or substantially the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office; and

(2) if either condition of [the] first part of the framework is satisfied, whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims.

Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH, IPR2019-01469, Paper 6 at 8 (PTAB Feb. 13, 2020) (precedential). Relevant to this analysis are six factors outlined in *Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 (PTAB Dec. 15, 2017) (precedential as to § III.C.5, first paragraph):

(a) the similarities and material differences between the asserted art and the prior art involved during examination;

(b) the cumulative nature of the asserted art and the prior art evaluated during examination;

(c) the extent to which the asserted art was evaluated during examination, including whether the prior art was the basis for rejection;

(d) the extent of the overlap between the arguments made during examination and the manner in which Petitioner relies on the prior art or Patent Owner distinguishes the prior art;

(e) whether Petitioner has pointed out sufficiently how the Examiner erred in its evaluation of the asserted prior art; and

(f) the extent to which additional evidence and facts presented in the Petition warrant reconsideration of the prior art or arguments.

Becton, Dickinson at 17–18. “[T]he *Becton, Dickinson* factors provide useful insight into how to apply the framework under 35 U.S.C. § 325(d).”

Advanced Bionics at 9 (footnote omitted). Factors (a), (b), and (d) pertain to the first part of the *Advanced Bionics* framework, while factors (c), (e), and (f) pertain to the second part of that framework. *Id.* at 10.

As discussed below, based on the *Advanced Bionics* framework, the record does not support Patent Owner’s request to discretionarily deny institution under 35 U.S.C. § 325(d).

B. Anticipation by Rădulescu2004 Is Only One of Four Asserted Grounds

Patent Owner argues that Rădulescu2004 is substantially the same as Dielissen and Rădulescu2000, which were cited references during prosecution. Prelim. Resp. 40–41. As Petitioner notes, however, this argument addresses only one of the four asserted grounds: Ground 1—the only ground that asserts only Rădulescu2004 alone. Prelim. Reply 3. Further, as set forth above, Ground 1 is not a ground for which we determine that Petitioner has demonstrated a reasonable likelihood of success.

Grounds 2 and 4, for which we determine Petitioner has demonstrated a reasonable likelihood of success, are based on the combination of Rădulescu2004 and OCP and the combination of Weber and Rădulescu2004, respectively. Pet. 3–4. Patent Owner does not argue that the combination of Rădulescu2004 and OCP or the combination of Weber and Rădulescu2004 constitutes the same or substantially the same art previously presented to the Office or involves the same or substantially the same arguments previously presented to the Office. Prelim. Resp. 39–44. Thus, discretionary denial under 35 U.S.C. § 325(d) is not warranted.

C. Rădulescu2004 Versus Dielissen and Rădulescu2000

Another reason why discretionary denial under 35 U.S.C. § 325(d) is not warranted is that Rădulescu2004 is not the same or substantially the same as Dielissen and Rădulescu2000.

Patent Owner argues that figures in Rădulescu2004 are nearly identical to figures in Dielissen. Prelim. Resp. 42; Prelim. Sur-reply 3–4. Further, Patent Owner asserts that Dielissen teaches a “connid,” like Rădulescu2004, which Patent Owner argues Petitioner relies on for the recited address range. Prelim. Resp. 42–43; Prelim. Sur-reply 4. Patent Owner also argues that Rădulescu2000 discloses narrowcast connections where a network interface performs mapping based on an address space. Prelim. Resp. 43 (citing Ex. 1010, 16–17). Further, Patent Owner argues that Petitioner relies on Rădulescu2004 for disclosing all the same elements of the independent claims as Dielissen and Rădulescu2000. *Id.* In addition, Patent Owner asserts that, “like Rădulescu2004, Dielissen and Rădulescu2000 disclose a fixed hardware configuration between modules and network interfaces that is required to be set up prior to receiving service requests during an operational stage, i.e., prior to mapping communication service requests.” *Id.*

In response, Petitioner argues that Rădulescu2004 is not substantially the same as Dielissen and Rădulescu2000. Prelim. Reply 3. Petitioner asserts that Rădulescu2004 describes a “slave for which a transaction is destined being ‘selected based on the address’ and explains that an ‘address range’ is assigned to a slave.” *Id.* (citing Ex. 1005, 4). Petitioner argues that Figure 3 of Rădulescu2004 illustrates this disclosure. *Id.* at 3–4. Petitioner asserts that Rădulescu2004’s disclosure of the address range and its Figure 3 are not in Dielissen or Rădulescu2000. *Id.* at 4. Petitioner argues that this difference amongst these references is material because Petitioner relies on the address range disclosure in Rădulescu2004 for the limitation that was added by the Applicant during prosecution to obtain the claims’ allowance. *Id.*

We agree with Petitioner that Rădulescu2004 is not substantially the same as Dielissen and Rădulescu2000. Rădulescu2004 discloses a pertinent address and address range that Dielissen and Rădulescu2000 do not, and the challenged claims recite an address range. Ex. 1005, 1, 2, 4, Fig. 5; *see* Section I.C. Although, as set forth above in Section III.A, we determine that Petitioner has not sufficiently shown that Rădulescu2004 by itself teaches or suggests the recited address range, we find that Rădulescu2004’s disclosed address and an address range is more pertinent to the recited address range than Dielissen and Rădulescu2000, and thus also more readily combined with OCP’s address range.

The recited address range was significant during prosecution of the ’052 patent. To obtain allowance of the pending claims, the Applicant amended the claims to include the communication thread/address range limitation, which, as discussed above, reads: “wherein said at least one communication service identification comprises at least one communication

thread or at least one address range, said address range for identifying one or more second processing modules (S) or a memory region within said one or more second processing modules (S).” Ex. 1002, 137–39 (emphasis omitted). As discussed above, this limitation is recited in preamble recitation 6.pre.2, limitation 1.f, and limitation 7.c. of the challenged claims. *See* Section I.C.

During prosecution of the ’052 patent, the Examiner rejected the pending claims as anticipated by both Dielissen and Rădulescu2000. Ex. 1002, 119. The Applicant responded to this rejection by amending the pending independent claims to include the communication thread/address range limitation. *Id.* at 137–39. The Applicant argued that neither Dielissen nor Rădulescu2000 discloses this limitation and that the pending claims should be allowed. *Id.* at 140, 143. After receiving this amendment and argument, the Examiner allowed the pending claims, and the Office issued the ’052 patent. *Id.* at 152.

As discussed in Section III.A.2.b above, Petitioner relies on Rădulescu2004 for the communication thread/address range limitation. In particular, Petitioner argues that “Rădulescu2004 discloses that a first processing module (the master) requests a communication service to a second processing module (the slave) based on a *communication service identification* as claimed.” Pet. 24. Petitioner continues: “Specifically, the requests in Rădulescu2004 include an address that identifies a slave and/or a memory within the slave.” *Id.* Petitioner further argues that Rădulescu2004 “discloses that each slave identified by an address has an address range associated therewith.” *Id.* Petitioner asserts that in Rădulescu2004 “the address range assigned to a particular slave (a *second processing module S*) is

‘configurable’ and ‘the slave for which the transaction is destined is selected based on the address.’” *Id.* (citing Ex. 1005, 4; Ex. 1003 ¶ 24).

The address range disclosure in Rădulescu2004 that Petitioner relies on for the communication thread/address range limitation is not in Dielissen or Rădulescu2000. Petitioner noted this distinction (Prelim. Reply 3–4), and Patent Owner did not cite any portion of Dielissen or Rădulescu2000 with this disclosure (Prelim. Sur-reply 3–5). Although Patent Owner argues that many of the figures of Rădulescu2004 are similar to figures in Dielissen, Patent Owner does not argue that any of those cited figures disclose a pertinent address range. Prelim. Sur-reply 4; *see also* Ex. 1011, Figs. 6–12. Patent Owner argues that Dielissen teaches the use of connid signals. Prelim. Resp. 42–43. Patent Owner does not, however, cite any description in Dielissen regarding connid signals that discloses an address range. *Id.*; Prelim. Sur-reply 3–5.

Patent Owner also argues that Rădulescu2004, like Dielissen and Rădulescu2000, discloses a fixed hardware configuration between modules and network interfaces that are required to be set up prior to receiving service requests during an operational stage. Prelim. Resp. 43. Patent Owner has not explained the pertinence of this argument to the § 325(d) analysis. *Id.* Further, as set forth above in Section III.A.2.b, we are not persuaded that this fixed hardware configuration argument distinguishes the challenged claims from Rădulescu2004.

Accordingly, we decline to exercise our delegated discretion under 35 U.S.C. § 325(d) to deny institution of *inter partes* review.

V. DISCRETIONARY DENIAL IN VIEW OF PARALLEL LITIGATION

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

Based on *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential) (“*Fintiv*”), Patent Owner argues that we should exercise our discretion under § 314(a) to deny institution in view of the Samsung litigation. Prelim. Resp. 1, 26–38. Petitioner argues that we should decline to exercise our discretion under § 314(a) to deny institution. Pet. 77–79.

A. *Nonexclusive Factors to Consider*

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

- (1) whether the court granted a stay or evidence exists that one may be granted if the Board institutes a trial;
- (2) the proximity of the court’s trial date to the Board’s projected statutory deadline for a final written decision;

- (3) the investment in the parallel litigation by the court and the parties;
- (4) the overlap in the issues raised by the petition and the issues in the parallel litigation;
- (5) whether the petitioner and the defendant in the parallel litigation are the same party; and
- (6) other circumstances that impact the Board's exercise of discretion, including the merits.

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

These factors “relate to whether efficiency, fairness, and the merits support the exercise of authority to deny institution in view of an earlier trial date in the parallel proceeding.” *Fintiv*, IPR2020-00019, Paper 11 at 6. Further, *Fintiv* instructs that the Board should take “a holistic view of whether efficiency and integrity of the system are best served by denying or instituting review.” *Id.*; see PTAB Consolidated Trial Practice Guide at 55–56, 58 (Nov. 2019) (“CTPG”).¹⁰

We also follow the Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation (June 21, 2022) (“Interim Procedure”).¹¹

B. Analysis

The Interim Procedure instructs that “the PTAB will not discretionarily deny institution in view of parallel district court litigation where a petitioner presents a stipulation not to pursue in a parallel proceeding the same grounds or any grounds that could have reasonably been raised before the PTAB.”

¹⁰ Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

¹¹ Available at https://www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621_.pdf.

Interim Procedure at 3 (citing *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 (PTAB Dec. 1, 2020) (precedential as to § II.A)); *see id.* at 7, 9. The Interim Procedure also explains that such a stipulation (a *Sotera* stipulation) “mitigates concerns of potentially conflicting decisions and duplicative efforts between the district court and the PTAB.” *Id.* at 7.

Petitioner presents a *Sotera* stipulation in the Petition. Pet. 77–78. Specifically, Petitioner stipulates as follows:

“if the PTAB institutes *inter partes* review, ‘Petitioner[s] will not pursue in [Network System Technologies, LLC v. Samsung Electronics Co., Ltd. et al., 2:22-cv-00481 (E.D. Tex.) and Network System Technologies, LLC v. Qualcomm Inc. et al., 1:22-cv-01331 (W.D. Tex.)] the specific grounds [asserted in this petition], or on any other ground . . . that was raised or could have been reasonably raised in an IPR.’”

Id. at 77 (alterations by Petitioner) (quoting *Sotera*, IPR2020-01019, Paper 12 at 13–14).

Patent Owner does not dispute that Petitioner presents a *Sotera* stipulation in the Petition. *See, e.g.*, Prelim. Resp. 26–38. Instead, Patent Owner asserts that Petitioner has not filed the *Sotera* stipulation with the district court or “otherwise formalized the stipulation.” *Id.* at 37. But Patent Owner cites no authority that a *Sotera* stipulation takes effect only when filed with a district court or “otherwise formalized.” *See id.* at 36–38.

Patent Owner further asserts that the Interim Procedure was “issued in violation of the notice-and-comment rulemaking set forth in 5 U.S.C. § 553(b).” Prelim. Resp. 28. We note Patent Owner’s argument. The district court, however, has not ordered the Office to not apply *Fintiv* or the Interim Procedure (Ex. 3002, 22–23), and under the Board’s Standard Operating Procedure 2, Rev. 11, the Interim Procedure is binding on the

Board. SOP2, Rev. 11, p. 2 (available at https://www.uspto.gov/sites/default/files/documents/20230724_ptab_sop2_rev11_.pdf).

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

IV. CONCLUSION

We determine that Petitioner has demonstrated a reasonable likelihood of proving the unpatentability of at least one challenged claim of the '052 patent. Further, we decline to exercise our delegated discretion to deny institution under 35 U.S.C. §§ 314 and 325. We clarify, however, that our analysis is based only on the record as it stands now and that we have not made a final determination regarding the patentability of any challenged claim. Further, no party should rely on any preliminary finding or determination in this Decision nor assume that the evidence cited in this Decision for any preliminary finding or determination will result in a similar finding or determination in the Final Written Decision after a complete record is developed.

V. ORDER

It is

ORDERED that, pursuant to 35 U.S.C. § 314(a) an *inter partes* review of claims 1–7 in the '052 patent is hereby instituted on the asserted grounds set forth in the Petition; and

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

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