

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD., GOOGLE LLC,
and SAMSUNG ELECTRONICS AMERICA, INC.,
Petitioners,

v.

HEADWATER RESEARCH LLC,
Patent Owner.

Case IPR2024-00341
Patent 8,406,733 B2

PATENT OWNER'S SUR-REPLY

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I. Introduction

In the Petition, Petitioner failed to provide any motivation or reason to use a bus in the context of TS-23.140, other than that “it was well-known to use a communications bus (e.g., a ‘D-bus’) for inter-process communications that enable applications to interface with one another, as TS-23.140 describes.” Pet. 30; *see also* Ex. 1003, ¶¶124-126 (also only alleging a rationale to use a bus as that it was “well-known” to “enable applications to interface with one another, as TS-23.140 describes,” and that this would be “nothing more than utilizing familiar, known components to achieve a predictable result”). In response, Dr. Brogioli explained that that understanding was not correct; for the *intra*-application communications contemplated by TS-23.140 (under the correct interpretation of TS-23.140), a POSITA would not look to a bus such as a D-bus, but would instead use standard application function calls, which Petitioner does not even allege would constitute the claimed “bus.”

In Reply, Petitioner *still* does not present any reason to use a bus for intra-application communication. Instead, Petitioner contends that neither the prior art nor the definition of a “bus” categorically “rule[s] out” using a bus for intra-application communication. *See* Reply 4-10. On this basis, Petitioner implies that the use of a bus would have been an obvious solution. Reply at 11-12. But the fact that a claim

term and the prior art do not render a proposed modification *impossible* is, of course, not sufficient for a showing of obviousness.

Petitioner's other arguments rely on the flawed premise that for an application to "reside on" an MMS User Agent, the application resides on the *device* and not the MMS User Agent which is defined as a software application. This is contrary to TS-23.140's *express definition* of "MMS User Agent" as referring to an "application residing on a UE [user equipment]" rather than the UE itself. Petitioner does not justify a departure from this explicit definition; indeed, the Reply does not even *mention* this definition.

In sum, given that the evidence of record makes clear that applications must "reside on" an MMS User Agent to receive application data in accordance with TS-23.140, such that they are subparts of the MMS User Agent, Petitioner must show that the use of a bus would have been obvious for intra-application communication of the sort envisioned by TS-23.140. Petitioner fails to set forth any motivation or other plausible reason *why* a POSITA would have designed a TS-23.140 system in that respect, such that Petitioner's invalidity challenge must fail.

II. Argument

As explained below, TS-23.140 is explicit that the destination applications *must* reside on the MMS User Agent such that they are subapplications of the MMS

User Agent. Thus, Petitioner must show that a POSITA would have been motivated to design a TS-23.140-compatible system to communicate data *within* an application using a bus. Petitioner, however, fails to do so.

A. In TS-23.140, the destination applications are subapplications of the MMS User Agent.

It is undisputed that in order for a destination application to receive application data via MMS, that application *must* reside on the MMS User Agent (or the similar “MMS VAS Applications”)¹. See POR 1, 8-9; Ex. 2001, ¶38, 45-48; Ex. 1004, 54 (“Applications that intend to transport application specific data using MMS may either reside on an MMS User Agent or on an MMS VAS Application.”). Indeed TS-23.140 teaches that *unless* a destination application resides on the MMS User Agent, the message *cannot be delivered*. Ex. 1004, 56 (“If the destination application *does not* reside on the receiving MMS User Agent..., the MMS User Agent... shall discard the corresponding abstract message.”).

It is also undisputed that the TS-23.140 specification defines “MMS User Agent” as an “application residing on a UE [user equipment]” or other device. Ex.

¹ Ex. 1004, 23 (“In many ways MMS VAS Applications behave like a fixed MMS User Agent.”). The primary difference is that, in practice, MMS VAS applications run on server elements rather than on an end-user’s mobile device. See *generally id.* at 17-18 (explaining that the MMS User Agent “resides on a UE” and provides users with various functionality).

1004, 14; *id.* at 18 (“The MMS User Agent resides on a UE.... It is an application layer function that provides the users with the ability to view, compose, and handle MMS....”); *see also* Ex. 2003, 28:17-19 (“Q. Okay. ***What is an MMS user agent?***
A. ***This is the software that’s running on a UE*** that receives the—the incoming MMS.”).

The sole dispute between the parties regarding these teachings is what “reside on an MMS User Agent” means. According to Petitioner, for an application to “reside on” an MMS User Agent, it must merely reside on the device, and need not reside on the MMS User Agent application software. *See* Pet. 6 (alleging that “reside on a MMS User Agent” means “reside on” a “device”); Reply at 22 (making explicit that this teaching means that “the destination applications disclosed in TS-23.140 ‘reside on’ the user equipment (UE)/terminal ***instead of the*** application”). But according to Patent Owner, for an application to “reside on an MMS User Agent,” it must reside on the MMS User Agent ***application*** (consistent with TS-23.140’s explicit definition of “MMS User Agent”), such that the destination application is a sub-application of the MMS User Agent. POR at 1-2, 8-9.

Notably, both Dr. Brogioli and Dr. Traynor agree that when the TS-23.140 refers to an application “resid[ing] on” another application in the context of the TS-

23.140's Section 7.1.18 describing "Support for transporting Application Data,"² it refers to that application as being a subapplication of that application. For instance, Dr. Brogioli testified that "these [destination] applications are incorporated into the MMS User Agent as 'subparts' or 'subapplications' (to use the terms Dr. Traynor used at his deposition) within the MMS User Agent application." Ex. 2001, ¶¶37-38, 46-48.

Likewise, Dr. Traynor made clear that "for an application to reside on [a] VAS application," that conveys that the "larger VAS application could have multiple subapplications" or "subparts" which would constitute the applications residing on the VAS application":

Q. Okay. So what I'm specifically asking is the specification says that applications may reside on an MMS VAS application, and my specific question is what it means for an application to reside on the VAS application.

A. Sure. So again, this is just going to be some -- some feature or function. So this larger VAS application could have multiple subapplications, so it's -- we have some -- we have some service that's implemented on this server.

² Ex. 1004, 54-56 (Section 7.1.18).

Q. So are these applications then part of the MMS VAS application, if they reside on it?

I'm just trying to understand what "reside on" means in this context.

ATTORNEY JHURANI: Objection to form.

THE WITNESS: So I -- I could imagine an application -- a VAS application that's games. And let's say it's from the same company, one is checkers, one is chess, they could reside within a larger application or application framework and still have these subparts for specific games.

Ex. 2003, 29:16-30:11.

Petitioner provides no explanation as to how an application could “reside on” an MMS User Agent *as defined by the TS-23.140 specification* without being a subapplication of the MMS User Agent. Instead, Petitioner’s entire theory that destination applications *are not* subapplications of the MMS User Agent relies on the premise that the prior art does not *actually* mean “MMS User Agent” in Section 7.1.18, but instead means “UE” or “terminal.” See Reply at 21-25 (alleging: “a POSITA would have understood that in the context of the standard that the destination applications in TS-23.140 ‘reside on’ the user equipment (UE)/terminal instead of the [MMS User Agent] application”).

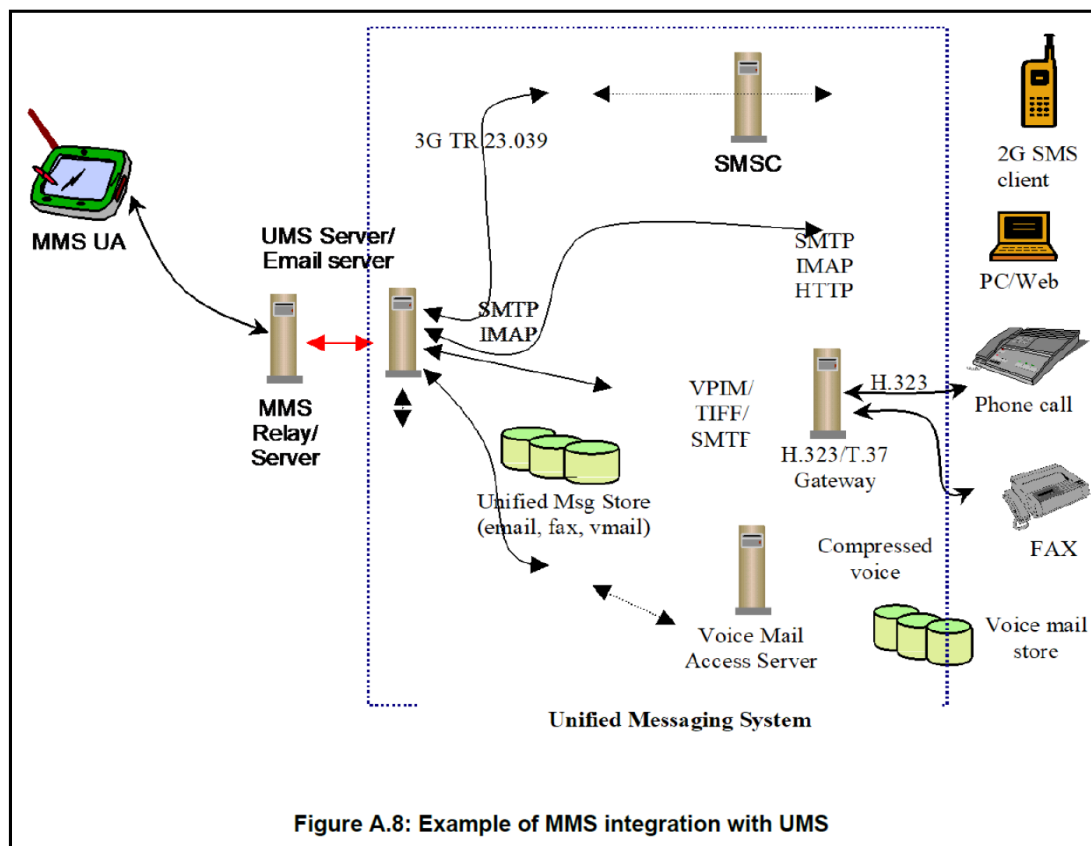
Petitioner’s theory in this regard is simply not plausible, because “MMS User Agent” is *explicitly* defined as an “application residing on a UE [user equipment]” or other device. Ex. 1004, 14. Petitioner’s argument that “MMS User Agent” really means “terminal / UE” rather than an *application residing* on a terminal / UE (as the TS-23.140 specification defines “MMS User Agent”) does not even *address* this explicit definition. *See generally* Reply 21-25. Indeed, *nowhere* in Petitioner’s Reply does Petitioner attempt to square Petitioner’s interpretation with this definition; the Reply does not even *mention* TS-23.140’s definition of “MMS User Agent.” *See generally* Reply.

Given that Petitioner does not even *attempt* to square its interpretation of TS-23.140 with that reference’s explicit definition, Petitioner’s interpretation should be rejected.

Petitioner’s arguments in support of its interpretation are unavailing, and certainly do not justify ignoring an express definition of the reference. For instance, Petitioner points to a teaching in TS-23.140 that teaches that “application data” is data “specific to an application other than the MMS User Agent.” Reply 22; *see also* Reply 19-21. This is merely drawing a distinction between the default MMS User Agent functionality and its subapplications (*see* Ex. 2001, ¶48), and Petitioner does not provide any reason why a POSITA would give this (at best, ambiguous)

statement more weight than the explicit definition of “MMS User Agent.” The same is true of Petitioner’s reliance on Mostafa (which is not part of the TS-23.140 specification), which shows an interface between the default User Agent functionality and the subapplications within the User Agent. *See* Reply at 21 (citing Ex. 1028, FIG. 4).³

Likewise, Petitioner points to TS-23.140's Figure A.8 (reproduced below) as supposedly labeling a terminal as a "MMS UA." Reply at 22-23.



³ Petitioner’s citation is incorrectly labeled as “EX-1004, FIG. 4.” *See* Reply at 21.

Ex. 1003, FIG. 8A. However, this is entirely consistent with TS-23.140's teachings that an MMS User Agent *resides on* a terminal; it is obviously much more difficult to graphically depict a specific application within a device than it is to depict the device itself. The fact that this Figure does not *equate* the device with the User Agent is shown by the *same figure's* labeling of a visual depiction of a telephone with "Phone call"; of course a telephone is not itself a "phone call," but it is much easier to depict a telephone that *makes* phone calls than it is to depict a phone call. Likewise, labeling a visual depiction of a device which includes User Agent functionality with "MMS UA" does not somehow redefine "User Agent" to mean "device."

Petitioner next points to a definition from outside the TS-23.140 specification that in certain contexts, a client *can* refer to a computer, in conjunction with another reference ("Mostafa") that refers to a User Agent as a "client." Reply at 23-24. But this dictionary makes clear that "client" *can also* refer to a software application. *See* Ex. 2004 (first and second definitions of "client" referring to software including a "program," and only the third definition referring to a computer).

Notably, the *more common* understanding of client as referring to a software application is consistent with *TS-23.140's* definition. It is telling that Petitioner ignores the more common definition of "client" (which is consistent with TS-

23.140's definition of "MMS User Agent," which Petitioner entirely ignores) in an attempt to interpret the Mostafa reference which provides a high-level description of various TS-23.140 teachings. But even Mostafa makes clear that it is applying **TS-23.140**'s definition of "MMS User Agent," and not using it to refer to a complete user device. *Compare* Ex. 1028, 731 (Mostafa stating that the "MMS user agent" is a "client" that "provides manes for composing, sending, retrieving, and other controlling functions to users"), *with* Ex. 1004, 18 (TS-23.140 stating that the "MMS User Agent resides on a UE," and "is an application layer function that provides the users with the ability to view, compose, and handle MMS (e.g., submitting, receiving, deleting of MMS)").

Petitioner's final attempt to equate the "MMS User Agent" with a terminal or UE is based on testimony that Dr. Brogioli gave in another proceeding. *See* Reply at 24 (discussing Ex. 1051, 51:21-53:6). (Petitioner did not depose Dr. Brogioli in this proceeding.) Specifically, Dr. Brogioli testified, in response to a question by Petitioner's counsel that interjected "user terminal" into a line of questioning that was previously about the "MMS User Agent," that it "sounds fair" that when an "MMS User Agent becomes reachable" by the MMS/Relay Server over a network, then the "user terminal" is reachable. *See* Ex. 1051, 52:4-53:6. Petitioner's reliance on Dr. Brogioli's testimony is unavailing: *of course* the MMS User Agent being

reachable shows that the corresponding *device* is reachable. For example, a server could not possibly communicate with an *application* (such as an MMS User Agent) on a device if the device itself is unreachable. Dr. Brogioli never stated, or even implied, that in the context of TS-23.140, the words “MMS User Agent” refer to a device or user terminal as Petitioner inaccurately suggests. Ex. 1051, 52:4-53:6. And there would of course be no reason for him to testify as much, in light of TS-23.140’s explicit definition to the contrary. *See* Ex. 1004, 14 (“MMS User Agent: application residing on a UE”).

Patent Owner further notes that Petitioner’s argument that a “chess application” would be understood to be separate from, and not a subapplication of, an MMS User Agent or VAS Application is *directly contrary to Petitioner’s expert testimony*. *See* Reply 20. Specifically, Dr. Traynor used a “chess application” as an *explicit example* of a subapplication within a VAS application (which is analogous to an MMS User Agent in the context of TS-23.140). *See* Ex. 2003, 29:16-30:11 (providing a “chess application” as an example of one of “multiple subapplications”); *see also* Ex. 2001, ¶47 (explaining that VAS applications and MMS User Agents are analogous in the context of the relevant portion of TS-23.140). Just as Petitioner completely ignores TS-23.140’s definition of “MMS User Agent,” Petitioner *also* entirely ignores Dr. Traynor’s testimony that for a “chess

application” to reside on another application, it would be a “subapplication” of that application. *See generally* Reply (not citing or addressing Dr. Traynor’s explicit admissions in Ex. 2003).

Accordingly, the evidence of record, including not only Patent Owner’s un rebutted expert testimony from Dr. Brogioli, but also TS-23.140’s definition of “MMS User Agent” as well as Dr. Traynor’s deposition testimony, confirms that applications that receive application data in TS-23.140 reside on, and are thus subapplications of, the MMS User Agent.

B. Petitioner fails to establish the obviousness of using a bus for intra-application communication in the context of TS-23.140.

In the Petition, Petitioner identified no affirmative reason why a POSITA would have implemented TS-23.140 messaging to destination applications as a “bus” other than that “it was well-known to use a communications bus (e.g., a ‘D-bus’) for inter-process communications that enable applications to interface with one another, as TS-23.140 describes,” and that doing so would have been simply using “familiar, known components to achieve a predictable result.” Pet. 30.

However, Petitioner’s and Dr. Traynor’s analysis was premised on the false assumption that destination applications were *outside* of the User Agent application. As Dr. Brogioli explained, a POSITA would *not* have “understood that the MMS

User Agent and other applications would interface’ through an agent communication bus,” as such a solution is not typically used for *intra*-application communication.

Petitioner criticizes Dr. Brogioli for only testifying regarding what was “typically” done, rather than stating that buses were *never* used for intra-application communication. *See* Reply at 6 n.3 (criticizing Dr. Brogioli for “not rul[ing] out” the use of a bus for intra-application communication, and for not “rendering an opinion on whether buses were *ever* used for communications with subapplications”). Petitioner apparently overlooks the fact that Dr. Brogioli is not omniscient, and could not truthfully represent that he is certain that no one has *ever* used a bus for that purpose because making such a broad claim would be impossible for him to verify.

Of course, however, it is *Petitioner’s* burden to prove obviousness, and Dr. Brogioli directly rebutted Petitioner’s contention that a POSITA “would have understood” that an agent communication bus would be used, and that this was a well-known solution in the context of systems such as TS-23.140. *See* Ex. 2001, ¶¶38, 49. Dr. Brogioli also explicitly testified that “a POSITA would not have found it obvious to use an ‘agent communication bus’ for transporting data *within* an application such as the MMS User Agent,” because simpler options that do not involve a bus are available and widely used for intra-application communication, and there would thus be no motivation to use a bus for this purpose. *Id.* ¶38.

Tellingly, Petitioner did not provide any rebuttal expert testimony in response (or even depose Dr. Brogioli on his opinions in this proceeding). Instead, Petitioner relies **solely** on attorney argument to characterize various references as supposedly disclosing the use of a bus to communicate data **within** an application as Petitioner's theory regarding TS-23.140 would require under the correct interpretation of that reference.

Petitioner's arguments that a POSITA would have believed a bus to communicate data **within** an application such as TS-23.140's MMS User Agent was a "familiar, known component," however, are all unsupported for the reasons discussed below.

First, Petitioner alleges that the definition of "agent communication bus" does not itself **exclude** a bus used for intra-application communication. *See* Reply 4-10. However, this is a red herring, as Patent Owner has *never* argued that the claimed "agent communication bus" would, *by definition*, exclude anything used for intra-application communication bus. Instead, Patent Owner made clear that POSITAs did not view the use of a bus as desirable for use in intra-application communications, such that the use of such a bus **would not have been obvious** to implement within the context of TS-23.140. POR at 9-11 ("It would not have been **obvious** for the MMS User Agent to use a 'bus' to communicate data to the subapplications residing

on the MMS User Agent.”). Even if Petitioner is correct that the definition of “agent communication bus” does not *categorically exclude* a bus used for intra-application communication (an issue on which Patent Owner has never taken any position because it is irrelevant to Patent Owner’s argument), that plainly would not be sufficient to show that the use of such a bus for intra-application communication *would have been obvious*.

Accordingly, Petitioner is incorrect that would be “fatal to Headwater’s argument” if “the Board agrees with Petitioners that the term ‘agent communication bus’ does not exclude communication links to a subapplication.” *See* Reply 16. Instead, such a finding would be completely *irrelevant* to Headwater’s argument.

Second, Petitioner presents attorney argument that buses were “used for communications with subapplications.” Reply at 14 (citing Ex. 1045, 96, 156-157; Ex. 1050, 2:64-3:6), 3:51-4:8 & FIG. 5; Ex. 1048 at ¶¶1, 3-4, 19). Petitioner’s reliance on newly submitted evidence in Reply in a purported effort to show that buses could have been used for intra-application communication are unavailing for several reasons.

As an initial matter, Petitioner presents no substantive analysis of these references. This is unsurprising, because the references Petitioner relies on are not supportive of Petitioner’s position. For example, the “Operating System Concepts”

textbook (Ex. 1045) teaches that different processes need some “interprocess communication (IPC) mechanism.” Ex. 1045 at 23 (book page 96). Petitioner characterizes this teaching as a teaching that a *software bus* would be used (*see* Reply at 14), but Operating System Concepts includes no such teaching; the excerpted portions of Operating System concepts do not mention a “bus” at all. *See generally* Ex. 1045.

Similarly, Savanyo (Ex. 1050) relates to real-time control systems that require an “asynchronous real-time controller.” Ex. 1050 at Title and 1:6-39. An example of such a controller is FIG. 11, where “the real-time system 20 is a single shaft system wherein the rotational speed of the shaft is controlled to accomplish some function” based on real-time signals such as “temperature” and “position.” *Id.* at 9:19-35; *see also id.* at FIGS. 11-20 (providing additional illustrations of the functionality of this real-time controller system).

The Savanyo reference does not discuss a software application at all, but rather refers to “subsystems” of “functional blocks.” *Id.* at 2:50-51 (“Next, the functional blocks are organized into subsystems (block 52).”). Savanyo does not state that these functional blocks are applications. Furthermore, Savanyo is clear that the purpose of “the software bus” is as “a buffer” that “ensures that... input values do not fluctuate during the time it takes to perform the subsystem’s calculation,”

given the extremely time-sensitive nature of the control system. *Id.* at 2:64-3:13. No similar rationale for including a bus exists in TS-23.140, as there is no evidence that any data would be improperly changed due to time constraints.

Indeed, Petitioner does not even allege that a real-time buffer bus as used in Savanyo (as opposed to the D-Bus proposed in the Petition) would even be *appropriate* for use in TS-23.140, given the extraordinary differences between an MMS messaging system and a real-time control system. Thus, even if Petitioner *were* correct that Savanyo discloses a bus for intra-application communication (it does not), this would not be supportive of a reason to use such a solution in the vastly different context of TS-23.140.

Likewise, Kravitz (Ex. 1048) teaches that there may be “[i]ntra application processes,” which are processes “that are within a same application.” Ex. 1048, ¶3. But nothing in Kravitz suggests that it would be obvious for these intra-application processes *to communicate between themselves using a bus* as Petitioner alleges. *See generally* Ex. 1048. Thus, Petitioner’s newly-introduced rebuttal evidence merely *confirms* that it was not well-known in the art to use buses for intra-application communication, because Petitioner has failed to identify *any* examples of such usage.

Furthermore, even if Petitioner's references *did* show the use of buses for intra-application communication (they do not), that would at most show that a TS-23.140 *could* have been modified to include a bus. That is not the requisite showing; Petitioner must show that a POSITA *would have been motivated* to implement TS-23.140 using a bus for intra-application communication, which Petitioner has failed to even allege. *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015) (“[O]bviousness concerns whether a skilled artisan not only *could have made* but *would have been motivated to make* the combinations or modifications of prior art to arrive at the claimed invention.”) (emphases in original); *see generally* Reply (no allegation of any *motivation* to use a bus). As the Supreme Court has held, even *if* a combination involves “known elements,” it is important to determine “whether there was an apparent *reason* to combine the known elements in the fashion claimed by the patent at issue.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 415 (2007).

And as Dr. Brogioli accurately testified and Petitioner has failed to rebut, a POSITA would understand that buses are typically not used for intra-application communication such that Petitioner's proposed solution would not have been an obvious implementation. Ex. 2001, ¶¶36-38 (“In my opinion, a POSITA would not have found it obvious to use an ‘agent communication bus’ for transporting data *within* an application such as the MMS User Agent, because applications are able to

effectively manage data and memory issues without the use of any type of ‘bus.’”) (emphasis in original); *id.*, ¶¶49-50 (“[B]ecause the applications are subapplications of the MMS User Agent, there would be no need or desire to use an agent communication bus to transfer data within the MMS User Agent to the appropriate subapplication....”).

As also explained by Dr. Brogioli, rather than use a “bus” for communication within the MMS User Agent in TS-23.140, a POSITA would have instead known that data would be directed to the appropriate subapplication via “standard function calls, such as UpdateAppData(AppID, AppData), which would simply write the AppData to a memory location within the subapplication of the MMS User Agent identified by the AppID.” Ex. 2001, ¶38. Accordingly, the use of a bus for this purpose would not be obvious. *Id.*

Petitioner does not meaningfully rebut this analysis, which provides a concrete example with implementation details regarding what a POSITA would have understood. For example, Petitioner did not provide rebuttal expert testimony, nor did Petitioner question Dr. Brogioli regarding this example. Nor does Petitioner contend that Dr. Brogioli’s example would *not* have been the standard way to implement intra-application communications. Nor does Petitioner contend that Dr. Brogioli’s example would meet the plain meaning of “agent communication bus.”

See Reply at 15 (correctly noting that “method calls” may be used to access a bus, but tellingly not alleging that *Dr. Brogioli’s example* would have involved any type of bus).⁴

Accordingly, under a correct interpretation of TS-23.140 (i.e., the only interpretation in accord with TS-23.140’s own definitions as well as the testimony of both experts), TS-23.140 involves intra-application communication, and Petitioner has failed to establish the obviousness of using an agent communication bus in this context.

III. Conclusion

TS-23.140 is explicit that the “MMS User Agent” is an “application residing on a UE.” Ex. 1004 at 14. And both Dr. Brogioli and Dr. Traynor agree that when an application “resides on” another application, it is a subapplication of that application. Ex. 2001, ¶38; Ex. 2003, 29:16-30:11. Petitioner in Reply does not even *address* these undisputed facts, which show that the destination applications in TS-23.140 are subapplications of the MMS User Agent.

Given this understanding of TS-23.140, Petitioner (even in Reply) still fails

⁴ Petitioner further argues that an “agent communication bus” can be used between processes located in the same “protected memory space.” Reply 16. Notably, Patent Owner has never alleged otherwise; instead, Patent Owner’s consistent position is that it would not be obvious to use an agent communication bus for intra-application communications. See POR 9-11.

to allege any plausible reason or rationale to transmit application data using an “agent communication bus.” Petitioner instead focuses a large portion of its Reply on arguments that it would be *possible* to implement intra-application communications using the claimed bus. *See, e.g.*, Reply 4-10 (arguing that the plain meaning of “agent communication bus” does not categorically exclude a bus used for intra-application communication). But Petitioner’s focus on whether its proposed modification might have been *possible* is not the correct inquiry, because “obviousness concerns whether a skilled artisan not only *could have made* but *would have been motivated to make* the combinations or modifications of prior art to arrive at the claimed invention.” *Belden*, 805 F.3d at 1073 (emphases in original).

And fatal to Petitioner’s theory, Petitioner fails to rebut Dr. Brogioli’s testimony that a POSITA would *not* have found it obvious to use a bus for intra-application communications as contemplated by TS-23.140. Accordingly, all challenged claims should be found not unpatentable.

Date: March 12, 2025

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CERTIFICATION REGARDING WORD COUNT

Pursuant to 37 C.F.R. §42.24(d), Patent Owner certifies that there are 4,266 words in the paper excluding the portions exempted under 37 C.F.R. §42.24(a)(1).

Date: March 12, 2025

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CERTIFICATE OF SERVICE (37 C.F.R. § 42.6(e)(1))

The undersigned hereby certifies that the above document was served on March 12, 2025, by filing this document through the Patent Trial and Appeal Case Tracking System as well as delivering a copy via electronic mail upon the following attorneys of record for the Petitioners:

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