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Paper 32
Entered: December 6, 2018

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

BMW OF NORTH AMERICA, LLC,
Petitioner,

v.

STRAGENT, LLC,
Patent Owner.

Case IPR2017-01520
Patent 8,566,843 B2

Before LYNNE E. PETTIGREW, PATRICK M. BOUCHER, and CHRISTA P. ZADO, *Administrative Patent Judges*.

BOUCHER, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

In response to a Petition (Paper 2, "Pet.") filed by BMW of North America, LLC ("Petitioner"), we instituted an *inter partes* review of claims 1–18 and 20–50 of U.S. Patent No. 8,566,843 B2 ("the '843 patent"). Paper 7 ("Dec."); Paper 19. During the trial, Stragent, LLC ("Patent Owner") filed a Response (Paper 10, "PO Resp.") to which Petitioner filed a Reply (Paper 25, "Reply"). An oral hearing was held with the parties, and a copy of the transcript was entered into the record. Paper 31 ("Tr.").[1]

We have jurisdiction under 35 U.S.C. § 6. This Decision is a Final Written Decision under 35 U.S.C. § 318(a) as to the patentability of the claims on which we instituted trial. Based on the record before us, Petitioner has shown, by a preponderance of the evidence, that claims 1–18 and 20–50 are unpatentable.

I. BACKGROUND

A. The '843 Patent

The '843 patent describes systems and methods "for sharing information in a distributed system." Ex. 1001, 1:29–30. Such systems and methods are illustrated for system architectures such as "may be situated in automotive electronics or industrial control and monitoring systems." *Id.* at 3:11–13. An example is provided in Figure 1 of the '843 patent, which is reproduced below.

[1] The hearing was a consolidated hearing for IPR2017-01519, IPR2017-01520, IPR2017-01521, and IPR2017-01522.

FIGURE 1

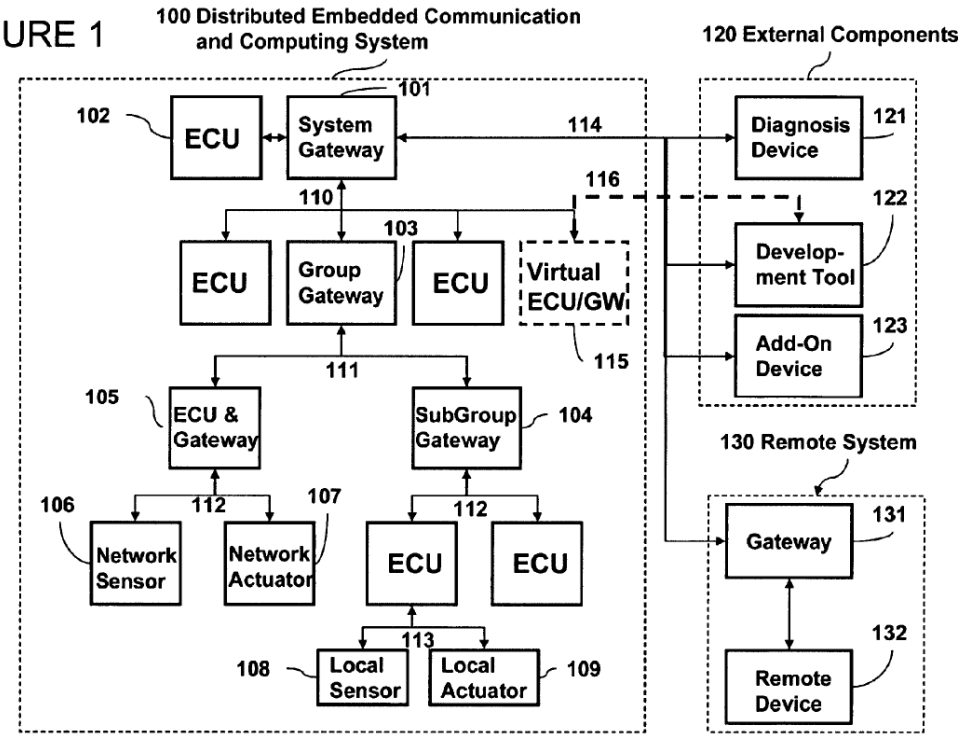


Figure 1 generally depicts elements of a distributed embedded communication and computing system. *Id.* at 3:9–11.

In an automotive environment, various electronic control units ("ECUs") control such applications as engine control, brake control, or diagnostics through connections to various sensors and actuators organized into separate subnetworks. *Id.* at 3:13–18. Such applications are themselves grouped into backbone system functions, such as "body control, power train, and chassis." *Id.* at 3:19–21. With a hierarchical organization that includes gateways 101, 103, 104, 105, messages are relayed up and down through the system layers. *Id.* at 3:24–26. Each layer may contain multiple ECUs connected through wired serial multiplexing bus systems, with the '843

patent noting several examples that include Controller Area Network ("CAN"), Local Interconnect Network ("LIN"), and FlexRay. *Id.* at 3:26–33.

At the highest level in the hierarchy, "the system level," system gateway 101 is connected via various busses to other system-level ECUs, to subsequent gateways 103, and to external components 120. *Id.* at 3:60–67. In addition, system gateway 101 may be connected to external gateway 131 to link the system to remote device 132. *Id.* at 4:1–6. "Subsequent to the system level may be several layers of groups and subgroups that are link[ed] to the higher levels via gateways (101, 103, 104, 105)." *Id.* 4:7–9.

In operation, ECU 102 receives "real-time" input variables from local sensors 108 or from networked sensors 106, respectively via signal lines 113 or multiplexing bus system 112. *Id.* at 3:39–42. "[R]eal-time may include any response time that may be measured in milli- or microseconds, and/or is less than 1 second." *Id.* at 3:36–38. ECU 102 processes the input variables and generates output variables that may be shared with other ECUs 102. *Id.* at 3:46–51. Two relevant modes of sharing are described.

First, ECUs 102 "typically share information with devices that are connected on the same physical multiplexing system. This method of information sharing is called horizontal information sharing in a hierarchical system." *Id.* at 3:51–55.

Second, a bulletin board may be used so that "the information is shared, in real-time, among a plurality of heterogeneous processes." *Id.* at

1:31–33. According to the ’843 patent, “heterogeneous networks may refer to any different communication networks with at least one aspect that is different.” *Id.* at 7:27–29. Figure 7 of the ’843 patent, reproduced below, illustrates a logical architecture between three heterogeneous network controllers using such a bulletin board.

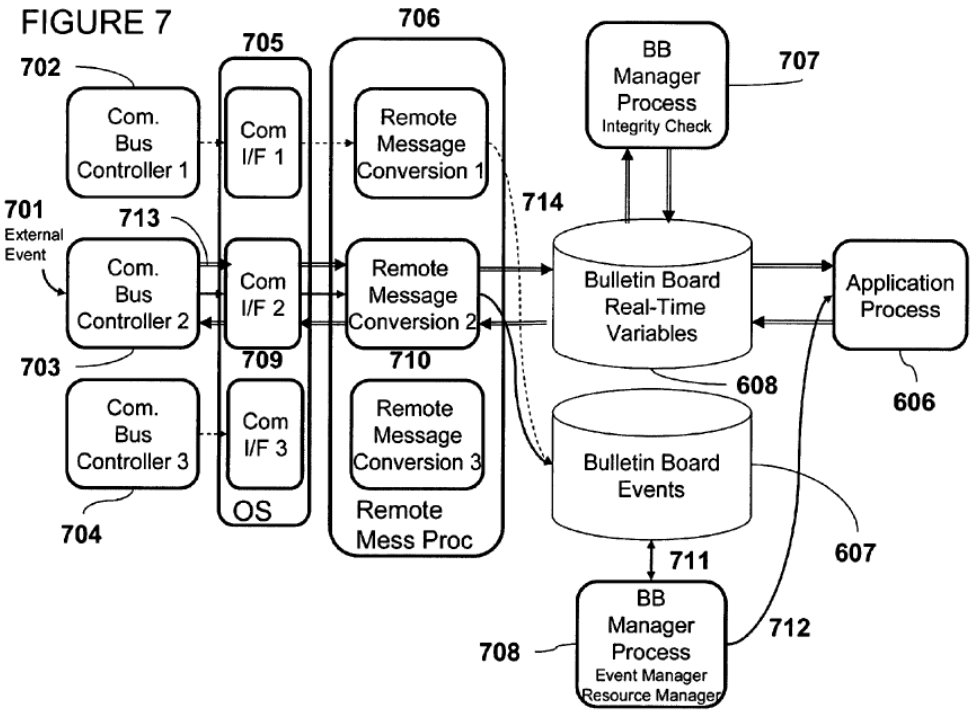


Figure 7 illustrates a system architecture in which a bulletin board acts as a shared memory interacting with multiple communication busses, with data received from one communication bus stored on the bulletin board and shared as a new message with other network types. *Id.* at 7:4–37.

The illustrated architecture includes four principal components: (1) network controllers 702, 703, and 704 (first column) for each of multiple heterogeneous networks; (2) associated operating system interfaces 705 for

each of the heterogeneous networks (second column); (3) remote message communication processes 706 for stripping out network-specific information (third column); and (4) the bulletin board, which may contain events 607, real-time variables 608, configuration parameters, and firmware. *Id.* at 5:63–67, 6:33–37. In operation, external event 701, such as a flag indicating that data from a sensor are available, is transmitted on a network to a communication bus controller, such as network controller 703 in the drawing. *Id.* at 7:4–9. This causes an operating system interface (such as communication interface 709) to notify a remote message communication process (such as remote message conversion method 710) that data are available, with notification provided in turn to application process 606. *Id.* at 7:4–17.

B. Prosecution History

The application that matured into the ’843 patent is a continuation of the application that matured into U.S. Patent No. 8,209,705 (“the ’705 patent”), filed July 30, 2008. Ex. 1001 at [63]. The ’705 patent is a continuation of U.S. Patent No. 7,802,263 (“the ’263 patent”), filed December 15, 2003. *Id.* The ’843 patent also claims the benefit of the filing date of U.S. Provisional Application No. 60/434,018 (“the ’018 provisional application”), filed December 17, 2002. *Id.* at [60].

At the time of filing the application that matured into the ’263 patent, independent claim 1 recited the following:

> 1. A method for sharing information in a distributed system, comprising:
>
> receiving information;
>
> storing the information on a bulletin board; and
>
> sharing, in real-time, the information among a plurality of heterogeneous processes.

Ex. 1011, 649. Although certain amendments were made to the claim during prosecution, allowance was secured only after an interview with the Examiner in which the applicants authorized the addition of several limitations: (1) "requesting a bulletin board resource of one or more bulletin boards"; (2) "determining whether the bulletin board resource is available"; (3) "in the event the bulletin board resource is not available, re-requesting the bulletin board resource until a threshold has been reached"; and (4) storing the information on the bulletin board resource "in the event the bulletin board resource is available." *Id.* at 250–252 (emphasis omitted).

Independent claim 1 was filed in the same original form at the time of filing the application that matured into the '705 patent. Ex. 1002, 255. During prosecution, the applicants amended the claims to add limitations similar to those that secured allowance of the claims of the '263 patent:

> in the event the storage resource is not available, <u>determining whether a timeout has been reached and</u> causing a re-request in connection with the storage resource <u>if the timeout has not been reached</u>; [and]
>
> <u>in the event the timeout has been reached, causing an error notification to be sent</u>.

Id. at 84–85 (underscoring in original to identify material added by amendment). These added limitations were among those identified by the Examiner in allowing the application as not "disclose[d] or suggest[ed]" "when taken in the context of [the] claims as a whole." *Id.* at 98–99.

Independent claim 1 was again filed in the same original form at the time of filing the application that matured into the '843 patent. Ex. 1018, 220. The originally filed claims were subsequently canceled during prosecution and applicants submitted new claims that included limitations similar to those that secured allowance in the prior applications. Ex. 1018, 116–32. The amended claims were subsequently allowed without express Reasons for Allowance by the Examiner. Ex. 1018, 63–94.

C. Illustrative Claim

Challenged claim 1, which is illustrative of the challenged claims, is reproduced below with numbers added to identify specific elements of the claim in accordance with the scheme used by Petitioner. *See* Pet. 16–38.

> 1. [0] A non-transitory computer-readable medium storing a computer program product for sharing information, the computer program product, comprising:
>
> [1] code for allowing receipt of information associated with a message received utilizing a first network protocol associated with a first network;
>
> [2] code for causing a determination as to whether a storage resource is available;
>
> [3] code for determining whether a threshold has been reached and causing a request in connection with the storage resource if the threshold has not been reached;

[4] code for, in the event the threshold has been reached, causing an error notification to be sent;

[5] code for, in the event the storage resource is available, causing storage of the information utilizing the storage resource; and

[6] code for causing the information to be shared by:

[7] in real-time, sharing the information utilizing at least one message format corresponding to a second network protocol associated with a second network;

[8] wherein the computer program product is associated with an electronic control unit with a plurality of interface portions including:

[9] a first interface portion for interfacing with the first network, the first interface portion including a first interface-related first layer part for receiving first interface-related first layer messages and a first interface-related second layer part, the computer program product being operable such that the first interface-related first layer messages are processed after which first interface-related second layer messages are provided, where the first network is at least one of a Controller Area Network type, a Flexray network type, or a Local Interconnect Network type; and

[10] a second interface portion for interfacing with the second network, the second interface portion including a second interface-related first layer part for receiving second interface-related first layer messages and a second interface-related second layer part, the computer program product being operable such that the second interface-related first layer messages are processed after which second interface-related second layer messages are provided, where the second network is at least one of the Controller Area Network type, the Flexray network type, or the Local Interconnect Network type.

Ex. 1001, 12:15–62.

D. Evidence

Petitioner relies on the following references. Pet. 9–16.

Millsap	US 6,484,082 B1	Nov. 19, 2002	Ex. 1015

OSEK/VDX Binding Specification, Version 1.3 (Sept. 17, 2001) ("OSEK Binding") (Ex. 1007)

OSEK/VDX Communication Specification, Version 2.2.2 (Dec. 18, 2000) ("OSEK COM") (Ex. 1008)

OSEK/VDX Network Management Concept and Application Programming Interface, Version 2.51 (May 31, 2000) ("OSEK NM") (Ex. 1009)

OSEK/VDX Fault-Tolerant Communication, Version 1.0 (July 24, 2001) ("OSEK FTCom") (Ex. 1010)[2]

William Wong, *Software And Hardware Standards Help, But In-Vehicle Network Growth Will Be Conservative: CAN networks and OSEK/VDX-compatible operating systems will drive tomorrow's vehicles*, 49 Elec. Design 62 (Jan. 8, 2001) ("Wong") (Ex. 1012).

In addition, Petitioner provides Declarations by Vijay K. Madisetti, Ph.D., Christopher Butler, and R. Benjamin Cassady, which we have also considered. Exs. 1003, 1013, 1014. No cross-examination testimony of these witnesses was filed in the proceeding.

[2] Petitioner refers to OSEK Binding, OSEK COM, OSEK NM, and OSEK FTCom collectively as "OSEK/VDX." Where we deem appropriate, we use the same terminology herein.

Patent Owner provides a Declaration by Jeffrey A. Miller, Ph.D. Ex. 2001. Dr. Miller was cross-examined by Petitioner, and a transcript of his deposition was entered into the record. Ex. 1031.

E. Asserted Grounds of Unpatentability

Petitioner challenges claims 1–18 and 20–50 over the following combinations of references. Pet. 9.

References	Basis	Claims
OSEK/VDX	§ 102(b)	1–18, 20, 21, and 24–50
OSEK/VDX	§ 103(a)	1–18, 20, 21, and 24–50
OSEK/VDX, Millsap, and Wong	§ 103(a)	1–18 and 20–50

We instituted this proceeding on all of the above-identified challenges, except the anticipation ground over OSEK/VDX. Dec. 26. Subsequent to instituting the proceeding, the Supreme Court held that a final written decision under 35 U.S.C. § 318(a) must decide the patentability of all claims challenged in a petition for *inter partes* review. *SAS Institute, Inc. v. Iancu*, 138 S. Ct. 1348 (2018). Accordingly, we notified the parties that "[w]e modify our institution decision to institute on all of the challenged claims and all of the grounds presented in the Petition." Paper 19, 2. Neither party requested further briefing in light of that notification.

F. Real Parties in Interest

Petitioner identifies BMW of North America, LLC, BMW Manufacturing Co., LLC, and Bayerische Motoren Werke, AG as real parties in interest in this proceeding. Pet. 99.

Patent Owner identifies only itself as a real party in interest. Paper 4, 1.

G. Related Proceedings

The parties identify the following district-court proceedings as involving the '843 patent: (1) *Stragent, LLC v. BMW of North America, LLC*, No. 6:16-cv-00446 (E.D. Tex.); (2) *Stragent, LLC v. Mercedes-Benz USA, LLC*, No. 6:16-cv-00447 (E.D. Tex.); and (3) *Stragent, LLC v. Volvo Cars of North America, LLC*, No. 6:16-cv-00448 (E.D. Tex.). Pet. 99; Paper 4, 1–2.

The following *inter partes* review proceedings also involve the '843 patent: IPR2017-00457, IPR2017-00677, IPR2017-01503, IPR2017-01504, and IPR2017-01519. The following *inter partes* review proceedings involve the related '705 patent: IPR2017-00458, IPR2017-00676, IPR2017-01502, IPR2017-01521, and IPR2017-01522.

II. ANALYSIS

A. Claim Construction

In an *inter partes* review proceeding based on a petition filed prior to November 13, 2018, the Board interprets claims of an unexpired patent using the broadest reasonable construction in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b) (2016); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard).[3] An inventor may provide a meaning for a term that is different from its ordinary meaning by defining the term in the specification with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

1. "real-time"

Independent claim 1 recites "in real-time, sharing the information." Ex. 1001, 12:33. Independent claims 47–50 include similar recitations directed to sharing information in "real-time." *Id.* at 16:31, 17:8, 17:40–41,

[3] The Office recently promulgated changes to the claim-construction standard applied in *inter partes* review proceedings. *Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board*, 83 Fed. Reg. 51,340 (Oct. 11, 2018). Because the Petition was filed before November 13, 2018, effective date of the rule change, those changes do not apply to this proceeding. *Id.* at 51,345 ("The Office will continue to apply the BRI standard for construing unexpired patent claims . . . in AIA proceedings where a petition was filed before the effective date of the rule.").

18:11–12. Petitioner argues that the Specification of the '843 patent expressly defines "real-time": "In the context of the present description, real-time may include any response time that may be measured in milli- or microseconds, and/or is less than 1 second." Pet. 6; Ex. 1001, 3:35–38. Accordingly, Petitioner proposes that "'real-time' should be construed as responses that occur in less than one second." Pet. 6 (citing Ex. 1003 ¶ 58). Patent Owner contends that the definition from the Specification should be adopted. PO Resp. 14.

We construe "real-time" as Petitioner proposes, i.e., as including responses that occur in less than one second. The first part of the quote cited above provided in the Specification ("may be measured in milli- or microseconds") is not limiting because *any* response time, no matter how large or small, may be *measured* in milli- or microseconds.

2. "threshold"

Independent claims 1 and 47 recite "determining whether a threshold has been reached and causing a request in connection with the storage resource if the threshold has not been reached." Ex. 1001, 12:24–26, 16:23–25. Independent claims 48–50 include similar recitations. *Id.* at 16:60–67, 17:32–34, 17:66–18:4. Petitioner proposes that "threshold" be construed consistent with a dictionary definition it provides, as a "level, point, or value above which something is true or will take place and below which it is not or will not." Pet. 6 (citing Ex. 1016, 5). Observing that the Specification of the

’843 patent uses “threshold” in the context of an elapsed time, Petitioner further proposes that this construction “include the maximum value (i.e., time-out) of a timer.” *Id*. (citing Ex. 1001, 8:21–25, 8:47–51). Patent Owner does not address construction of the term in its Response. We agree with Petitioner’s reasoning in light of the Specification, and accordingly construe “threshold” as Petitioner proposes.

3. “heterogeneous networks”

Dependent claims 26 and 32 recite that “the first network and the second network are heterogeneous networks.” Ex. 1001, 14:40–41, 15:10–11. The Specification of the ’843 patent defines “heterogeneous networks”: “In the context of the present description, heterogeneous networks may refer to any different communication networks with at least one aspect that is different.” Ex. 1001, 7:26–29. In light of this explicit definition, we construe “heterogeneous networks” as Petitioner proposes, i.e., as “networks having at least one aspect that is different.” Pet. 7 (citing Ex. 1003 ¶ 60). Patent Owner does not address construction of the term.

4. “isolated from temporal characteristics”

Dependent claim 32 recites that “each of a plurality of different processes process the information in a manner that is isolated from temporal characteristics associated with the heterogeneous networks.” Ex. 1001, 15:11–14. Petitioner proposes that “isolated from temporal characteristics”

be construed as "unaffected by the temporal behavior," and supports its proposed construction with examples provided in the Specification and with testimony by Dr. Madisetti. Pet. 7 (citing Ex. 1001, 8:47–51, 8, 64–9:2, 11:10–13; Ex. 1003 ¶ 61). Patent Owner does not address construction of the term. Petitioner's proposed construction is reasonable, and we adopt it.

5. "network layer translation"

Dependent claim 35 recites that "the storage resource is operable so as not to require a network layer translation of messages." Ex. 1001, 15:27–28. According to Petitioner, "[t]he only place where 'translation' is mentioned in the specification, other [than] in claim 35 itself," occurs in identifying "enhancements" that address "shortcomings of traditional computer networks," namely, "[t]he concept of a direct-access bulletin board that does not require a network layer translation of messages on each node of the network." Pet. 8; Ex. 1001, 11:19–20, 11:30–35. Petitioner asserts, supported by the testimony of Dr. Madisetti, that a person of ordinary skill in the art "would have understood the term to mean removing network information, such as network addresses and communication network problems," and therefore proposes construing "network layer translation" as "removing network information." Pet. 8 (citing Ex. 1003 ¶ 62). Patent Owner does not address construction of the phrase. Petitioner's proposed construction is reasonable, and we adopt it.

6. Information Sharing

Patent Owner identifies recitations in each of the independent claims that relate to real-time sharing of information. PO Resp. 12. Patent Owner's argument regarding the construction of such recitations can be illustrated with independent claim 1, which recites "code for causing the information to be shared by: in real-time, sharing the information utilizing at least one message format corresponding to a second network protocol associated with a second network." Ex. 1001, 12:32–35. According to Patent Owner, "the words '*the* information' clearly refer to information previously identified in the claims." PO Resp. 12. In claim 1, Patent Owner contends that "it is the 'information associated with a message received utilizing a first network protocol associated with a first network' (limitation 1.1) which was caused to be stored utilizing the storage resource (limitation 1.6[4]) – i.e., it is information whose storage was completed to the bulletin board or the storage resource." *Id.* at 13. Bootstrapping this argument, Patent Owner similarly contends that "the second network" recited in limitation 7.10 is "utilizing a second different protocol which is the recipient of the 'shared' information connected to the storage resource." *Id.* at 14–15 (citing Ex. 2001 ¶ 33).

Patent Owner thus contends that information sharing, as recited in the independent claims, requires completion of storage to the recited bulletin board or storage resource. Patent Owner also cites a general-dictionary

[4] Patent Owner appears to intend to refer to limitation 1.5.

definition of "share" as "to partake of, use, experience, occupy, or enjoy with others; to have in common." *Id.* at 14 (citing Ex. 2003).

We are not persuaded by Patent Owner's contention. Outside of the preamble, claim 1 first recites "information" as part of the requirement of "code for allowing receipt of information associated with a message received utilizing a first network protocol associated with a first network." Ex. 1001, 12:19–21. The claim includes recitations for various code that contemplate potentially different actions depending on the satisfaction of different conditions. For example, code causes a "determination as to whether a storage resource is available," and, "in the event the storage resource is available," code "caus[es] storage of the information utilizing the storage resource." *Id.* at 12:22–23, 12:29–31. But additional code causes "a request in connection with the storage resource if [a] threshold has not been reached" and causes an error notification to be sent if "the threshold has been reached." *Id.* at 12:22–28. The plain language of the claim does not require that "the information" be stored using the "storage resource" under all conditions.

The plain language of the claim *does*, though, always require the presence of "code for causing the information to be shared," specifically by "in real-time, sharing the information utilizing at least one message format corresponding to a second network protocol associated with a second network." *Id.* at 12:32–35. Nothing in the plain language of this element requires that "the information" have been stored with the storage resource.

Indeed, Petitioner identifies "embodiments of the specification that share information not using a shared storage." Reply 7. In particular, the Specification of the '843 patent describes "horizontal information sharing in a hierarchical system" where output variables generated by an ECU are output to local actuators, which are connected via discrete signal lines or networked actuators connected via a multiplexing bus. *See* Ex. 1001, 8:51–59, 7:38–49 ("In an alternate embodiment of the remote message communication process . . . [t]o communicate between two heterogeneous networks, this process may then be repeated in reverse by adding back the header information for the various layers of the second network, and eventually putting the message onto the second network's physical link."); *see* Tr. 10:19–12:7 (Petitioner, at oral hearing, discussing embodiment that shares information without using a shared storage). Furthermore, the description of "information" as "capable of being stored *or* shared" in the '843 patent Specification is consistent with storage and sharing being distinct concepts. *See* Ex. 1001, 3:56–59 (emphasis added).

At the oral hearing, Patent Owner argued that "the information" recited in element 1.7 ("in real-time, sharing *the information* utilizing at least one message format corresponding to a second network protocol associated with a second network") (emphasis added) necessarily refers to "the information" recited in element 1.5 (code for, in the event the storage resource is available, causing storage of *the information* utilizing the storage resource") (emphasis added):

> Our position is that the information then appears in Element 1.5, which says the information is stored utilizing a storage resource. Therefore, the next time the word the information is used, it's now referring to the last antecedent basis, which is no longer Element 1.1. The last antecedent basis is Element 1.5.

Tr. 48:10–14. But Patent Owner is unable to identify sufficient legal basis for its "last antecedent" theory. *See id.* at 40:8–15 ("I have not found the concept in patent claim construction.").

In addition to these considerations, we note that Patent Owner has submitted a definition of "share" drawn from a technical dictionary into the record of this proceeding. Ex. 2004.[5] We find the technical dictionary provided by Patent Owner to be more probative than the general-purpose dictionary Patent Owner quotes.

The language of the general-purpose dictionary definition of "share" that states "to partake of, use, experience, occupy, or enjoy with others; to have in common," does not appear to contemplate the sharing of "information," which the '843 patent Specification describes as "includ[ing] data, a signal, and/or anything else capable of being stored and shared." *See* Ex. 2003 (general definition of "share"); Ex. 1001, 3:56–59. Instead, the

[5] We note that, even if Patent Owner had not entered Exhibit 2004 into this proceeding, judges are free to rely on extrinsic dictionary definitions when construing claim terms, so long as the dictionary definition does not contradict any definition found in or ascertained by a reading of the patent documents. *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1584 n.6 (Fed. Cir. 1996) *see Phillips v. AWH Corp.*, 415 F.3d 1303, 1322–23 (Fed. Cir. 2005) (en banc).

technical definition of "[t]o make files, directories, or folders accessible to other users over a network" is more relevant because it expressly contemplates the same context as the '843 patent, i.e., sharing over a network. Ex. 2004 (technical definition of "share").

Thus, the plain language of the claim, intrinsic evidence in the form of the Specification, and extrinsic evidence in the form of a technical-dictionary definition all support a construction of information sharing that requires making the information accessible, without requiring storage of the information. We accordingly construe the various recitations of information sharing in the claims in accordance with such requirements.

7. Other Terms

We do not find it necessary, for purposes of this Decision, to construe any other terms explicitly. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)) (only terms in controversy need to be construed, and only to the extent necessary to resolve the controversy).

B. Effective Filing Date

Petitioner contends that the challenged claims are entitled to claim the benefit of only the December 15, 2003, filing date of the '263 patent, and, in particular, that they are not entitled to the December 17, 2002, filing date of

the ’018 provisional application. Pet. 3–5. Petitioner argues that “the ’263 patent is the first instance that even arguably discloses the memory-related limitations,” and that the ’018 provisional application does not disclose at least the following memory-related limitations of claim 1:

> “determining whether a threshold has been reached and causing a request in connection with the storage resource”; and “in the event the storage resource is available, causing storage of the information utilizing the storage resource[,]” . . . [and] at least the following limitation of claim 50: “when the storage resource is not available and the threshold associated with the storage resource request has not been reached, issuing another storage resource request in connection with the storage resource.”

Id. at 4–5 (footnotes omitted). Petitioner further contends that “the [’018] provisional application simply states that ‘the bulletin board manager provides mechanisms for access control,’” and that “[t]his broad statement . . . fails to disclose the limitations above.” *Id.* (citing Ex. 1005, 9). Patent Owner does not present any evidence or argument that the ’843 patent is entitled to claim the benefit of the ’018 provisional application filing date.

For a claim of a patent to claim priority from the filing date of its provisional application, the provisional application must contain a written description of the claim in the manner set forth under 35 U.S.C. § 112. 35 U.S.C. § 119(e)(1). Although a petitioner bears the ultimate burden of persuasion to show a claim is unpatentable, a second and distinct burden—the burden of production—is a shifting burden. *Dynamic Drinkware, LLC v. National Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). In cases

such as here, where Petitioner has presented sufficient evidence and argument of unpatentability based on a reference that pre-dates the filing date of the ’263 patent, Petitioner meets its initial burden of production. *Id.* at 1379. The burden then shifts to Patent Owner to show that the ’018 provisional application provides written description support for the challenged claims of the ’843 patent. *Id.* at 1380. As we discussed above, Patent Owner does not provide any evidence or argument in this regard, and therefore does not meet its burden of production to show the challenged claims are entitled to the benefit of the ’018 provisional application filing date. Therefore, based on the record, we accord the challenged claims the December 15, 2003, filing date of the ’263 patent.

We note that, although the burden has not shifted to Petitioner, the Petition identifies specific claim limitations Petitioner contends are unsupported by the ’018 provisional application and identifies specific disclosure in the ’018 provisional application that it contends is insufficient. Pet. 4–5.

C. Legal Principles

To establish anticipation, each and every element in a claim, arranged as recited in the claim, must be found in a single prior art reference. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008); *Karsten Mfg. Corp. v. Cleveland Golf Co.*, 242 F.3d 1376, 1383 (Fed. Cir. 2001). While the elements must be arranged in the same way as is recited in

the claim, "the reference need not satisfy an *ipsissimis verbis* test." *In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009); *In re Bond*, 910 F.2d 831, 832–33 (Fed. Cir. 1990). Identity of terminology between the anticipatory prior art reference and the claim is not required. Prior art references must be "'considered together with the knowledge of one of ordinary skill in the pertinent art.'" *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

Also, "it is proper to take into account not only specific teachings of the reference but also the inferences which one skilled in the art would reasonably be expected to draw therefrom." *In re Preda*, 401 F.2d 825, 826 (CCPA 1968). As the Court of Appeals for the Federal Circuit recently explained, the dispositive question for anticipation is whether one skilled in the art would reasonably understand or infer from a prior art reference that every claim element is disclosed in that reference. *Eli Lilly & Co. v. Los Angeles Biomedical Research Inst.*, 849 F.3d 1073, 1074–75 (Fed. Cir. 2017).

A claim is unpatentable for obviousness under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are "such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the

prior art; (3) the level of skill in the art; and (4) when in evidence, objective indicia of non-obviousness, i.e., secondary considerations.[6] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

Additionally, the obviousness inquiry typically requires an analysis of "whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue." *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (requiring "articulated reasoning with some rational underpinning to support the legal conclusion of obviousness")); *see In re Warsaw Orthopedic, Inc.*, 832 F.3d 1327, 1333 (Fed. Cir. 2016) (citing *DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1360 (Fed. Cir. 2006)).

To prevail on its challenges, Petitioner must demonstrate by a preponderance of the evidence that the claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). "In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify "with particularity . . . the evidence that supports the grounds for the challenge to each claim")). This burden never shifts to Patent Owner. *See Dynamic Drinkware*, 800 F.3d at 1378 (citing *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1326–27 (Fed. Cir.

[6] The parties do not address secondary considerations, which accordingly do not form part of our analysis.

2008)) (discussing the burden of proof in *inter partes* review). Furthermore, Petitioner does not satisfy its burden of proving obviousness by employing "mere conclusory statements." *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

D. Level of Skill in the Art

The parties advocate for the adoption of similar levels of ordinary skill in the art. Petitioner contends that a person of ordinary skill "would have a bachelor's degree in science in electrical engineering, computer engineering, or a related engineering discipline and at least two years of industry experience in the field of distributed computing or automotive engineering, or equivalent experience, education, or both." Pet. 5. In addition, Petitioner contends that such a person "would also have knowledge or familiarity with in-vehicle computing." *Id.* (citing Ex. 1003 ¶¶ 65–66). Dr. Madisetti's testimony supports Petitioner's proposal. Ex. 1003 ¶¶ 65–66.

> Patent Owner similarly contends that a person of ordinary skill would have had at least the qualifications of or equivalent to either a master's degree in electrical engineering, computer science, or computer engineering with course work or research in embedded networking technologies or an undergraduate degree in electrical engineering, computer science, or computer engineering with at least two years of relevant work experience in industry.

PO Resp. 19. Dr. Miller's testimony supports Patent Owner's proposal. Ex. 2001 ¶ 17. The principal difference between the levels proposed by the parties is Petitioner's requirement that the person have knowledge or familiarity with "in-vehicle computing." Although the Specification illustrates its systems and methods for sharing information in a distributed system in the context of vehicle applications, the claims are not so limited. We are not persuaded that familiarity with in-vehicle computing would be a characteristic of a person of ordinary skill in the relevant art. We therefore adopt Patent Owner's expression of the level of skill in the art, noting that, in contrast to Petitioner's proposal regarding familiarity with in-vehicle computing, the proposal we adopt requires some level of familiarity with embedded networking technologies.

E. Testimony of Dr. Miller

Petitioner argues that the testimony of Patent Owner's expert, Dr. Miller, "deserves little weight because he misapplies the law and provides contradictory testimony." Reply 2. Specifically, Petitioner contends that Dr. Miller (1) does not understand or apply the principles of broadest reasonable interpretation in his claim constructions; (2) imports limitations from the Specification into the claims; (3) does not understand what defines an invention; and (4) cannot identify an antecedent basis. *Id.* at 3.

As Petitioner recognizes, in a related *inter partes* review proceeding, we "agree[d] with Petitioner that Dr. Miller did not provide responses sufficient to conclude that he was aware of and/or applied the correct claim-construction standard." *BMW of N. Am., LLC v. Stragent, LLC*, Case IPR2017-00677, slip op. at 13–14 (PTAB June 13, 2018) (Paper 32). But deficiencies in Dr. Miller's testimony in that earlier proceeding have largely been cured in the instant proceeding. *See, e.g.*, Ex. 2001 ¶ 28 ("I have been advised, and it is my understanding, that patent claims in IPR proceedings such as this are given their broadest reasonable construction in view of the patent claims, specification, file history, and the understanding of one having ordinary skill in the relevant art at the time of the invention.").

We have reviewed the deposition testimony to which Petitioner draws our attention, and disagree that Dr. Miller's imprecisions regarding patent law are sufficient to discount or limit the weight accorded to his opinions. *See* Reply 3–6. Technical experts are not expected to be legal authorities, and Dr. Miller's opinions are helpful to us as the trier of fact. *See* Fed. R. Evid. 702 (stating conditions under which an expert witness may testify in the form of an opinion). We are also not persuaded by Petitioner's argument that Dr. Miller's opinions should be given reduced weight because "he is a pay for opinion expert, whose opinions reflect counsel instructions rather than his views." Reply 5. Despite Petitioner's allusions, we see nothing irregular or improper with Dr. Miller's acknowledgment that Patent Owner's "attorneys did provide some clarifications and help in preparing the

declaration." *See id*.; Ex. 1031, 30:21–24. Dr. Miller swears to the statements in his Declaration under penalty of perjury, and we see no compelling reason not to accord those states due weight. Ex. 1031, 53.

F. Anticipation by OSEK/VDX

Petitioner's expert, Dr. Madisetti, describes OSEK/VDX as "a joint project by sixty-two automotive companies creating an open-ended architecture standard for distributed ECUs in vehicles." Ex. 1003 ¶ 82 (citing Ex. 1007, 2). Dr. Madisetti further explains that "OSEK/VDX is a standard for interfacing distributed ECUs with real-time operating systems found in automotive networks," including "seven specifications that together describe 'interfaces and protocols for the transfer of data . . . between and within network stations (ECU's).'" *Id.* ¶ 83 (quoting Ex. 1007, 6) (alteration by Dr. Madisetti).

Petitioner's anticipation challenge based on OSEK/VDX relies on a combination of four references (OSEK Binding, OSEK COM, OSEK FTCom, and OSEK NM) that describe different aspects of various versions of the OSEK/VDX standard. *See* Pet. 9. Petitioner focuses its attention on version "SB3," which OSEK Binding discloses as encompassing the specific documents relied on, i.e., including version 1.3 of the Binding specification, version 2.2.2 of the communication ("COM") specification, version 2.5.1 of the network-management ("NM") specification, and version 1.0 of the OSEKtime COM ("FTCom") specification. Ex. 1007, 9.

Petitioner contends that these individual specifications "were originally available at http://osek-vdx.org" and were archived by the Wayback Machine on September 26, 2001, more than a year before both the effective filing date we accord the claims and more than a year before the filing date of the '018 provisional application. Pet. 11–12. To support its contention that the individual documents were publicly accessible on September 26, 2001, Petitioner provides a Declaration of Christopher Butler, Office Manager at the Internet Archive, which manages the Wayback Machine, attesting to its practices regarding archival of files on the Internet. Ex. 1013. Petitioner additionally provides a Declaration of R. Benjamin Cassady, attesting to his retrieval of certain documents, including Ex. 1006, which Petitioner contends "confirms that OSEK[ ]FTCom was known to a [person of ordinary skill in the art] at least by December 10, 2002." Ex. 1014; Pet. 13. Petitioner provides sufficient evidence that each of OSEK Binding, OSEK COM, OSEK FTCom, and OSEK NM is a printed publication.

Nevertheless, we are not persuaded that the four documents are properly considered to constitute a single prior-art reference. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, *in a single prior art reference*." *Verdegaal Bros., Inc. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987) (emphasis added).

Petitioner contends that "OSEK/VDX is a 'single prior art reference' and thus qualifies as prior art under §102(a) and/or (b) because the standard comprises only seven specifications, all authored by the same group, and would be considered together, evidenced by their linking and cross-referencing." Pet. 13–14 (citing *Enzo Biochem, Inc. v. Gen-Probe Inc.*, 424 F.3d 1276, 1285 (Fed. Cir. 2005)). Although Petitioner correctly observes that "[t]he OSEK/VDX specifications are indexed within OSEK Binding," Petitioner's overall focus on what it contends is common authorship insufficiently accounts for the different dates of creation of the individual documents. Pet. 23; *see Kyocera Wireless Corp. v. Int'l Trade Comm'n*, 545 F.3d 1340, 1351–52 (Fed. Cir. 2008) (noting "the GSM standard is actually several prior art references with separate dates of creation, rather than a single prior art reference," and "the GSM standard is simply not a coherent whole document that can be assigned a single prior art date of creation").

First, each of the individual documents bears a different date on its face, belying any conclusion that they are properly considered as a single reference. Ex. 1007, 1 (Binding Specification dated September 17, 2001); Ex. 1008, 1 (Communication specification dated December 18, 2000); Ex. 1009, 1 (Network Management specification dated May 31, 2000); Ex. 1010, 1 (Fault-Tolerant Communication specification dated July 24, 2001). The SB3 version of the OSEK/VDX standard evidently arises from selective reference to different versions of the individual specifications as they have evolved over time. *See* Ex. 1007, 3 ("As the standardisation of

requirements that are applicable to different OSEK/VDX specifications should not be replicated within the different specifications, this document is therefore set-up to collate all requirements that are owned by the different specifications.") (italicization omitted).

Second, Petitioner's argument that the individual documents are commonly authored is tenuous at best. Petitioner too sweepingly treats two groups responsible for creation of the documents (the "OSEK group" and the "OSEK/VDX steering committee") as defining a single authorship, without addressing the composition of those groups and potential changes in that composition over the time period in which the individual specifications were created. *See* Pet. 14. This deficiency is particularly notable in light of the large number of entities (sixty-two automotive companies) that "attended and contributed to the OSEK/VDX Technical Committee." *See* Ex. 1007, 2.

Accordingly, we find that OSEK Binding, OSEK COM, OSEK FTCom, and OSEK NM are not collectively a "single prior art reference," and therefore conclude that Petitioner has not shown, by a preponderance of the evidence, that claims 1–18, 20, 21, and 24–50 are anticipated by the collection of documents identified by Petitioner as OSEK/VDX.

G. Obviousness over OSEK Binding, OSEK COM, OSEK FTCom, and OSEK NM

As an alternative to its anticipation challenge, Petitioner contends that claims 1–18, 20, 21, and 24–50 would have been obvious over OSEK/VDX.

Pet. 90. Petitioner reasons that a person of ordinary skill in the art "would naturally consider the OSEK/VDX specifications together in order to gain a complete understand[ing] of the standard and the capabilities of ECU nodes," supporting that reasoning with testimony by Dr. Madisetti. *Id.* (citing Ex. 1003 ¶ 395). Particularly in light of OSEK Binding's specific reference to each of the specifications in defining version SB3 (Ex. 1007, 9), we agree with that contention and conclude that Petitioner articulates sufficient reasoning to combine the teachings of the four documents. Patent Owner does not contest Petitioner's rationale for combining the teachings of the four documents.

1. Independent Claim 1

a. Preamble

The preamble of challenged claim 1 recites "[a] non-transitory computer-readable medium storing a computer program product for sharing information." Ex. 1001, 12:16–17. Petitioner contends that the OSEK/VDX references relate to "interfaces and protocols for in-vehicle communication . . . between networked vehicle nodes (inter-ECU communication)," and that they disclose that the system can be implemented by software, i.e., "a computer program product." Pet. 16–17. We agree with the contention, which Patent Owner does not address in its Response.

b. Element 1.1

In analyzing the specific limitations in the body of claim 1, the Petition focuses primarily on OSEK NM, supplementing its analysis with specific reference to portions of OSEK COM, particularly in addressing limitations dealing with the treatment of the availability of a storage resource and real-time sharing of information, as well as in addressing the interfaces recited in limitations 1.9 and 1.10. Pet. 16–38.

Figure 2 of OSEK NM is reproduced below.

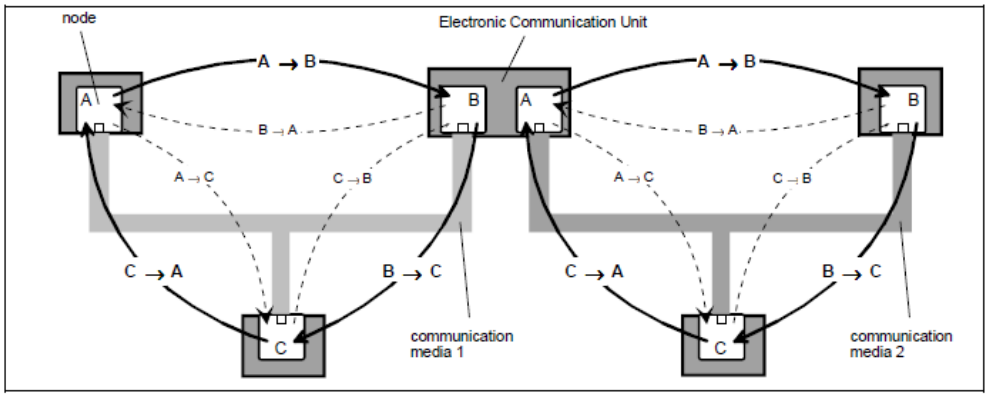


Figure 2 Infrastructure of the NM (logical ring), example with two busses

Figure 2 shows an infrastructure of a logical ring that includes an electronic communication unit and in which, for example, node A receives messages from node C. Ex. 1009, 9. According to Petitioner, OSEK/VDX discloses limitation 1.1, "code for allowing receipt of information associated with a message, utilizing a first network protocol associated with a first network." Pet. 17–18. According to Petitioner, OSEK/VDX describes receiving information associated with a message by virtue of its disclosure of transmitting and receiving information between ECUs using networks such

as CAN, VAN, J158, K-BUS, and D2B. *Id.* at 17 (citing Ex. 1009, 7). Petitioner reasons that OSEK/VDX discloses using a "first network protocol associated with a first network" because each of the disclosed networks has a network protocol associated with it. *Id.* (citing Ex. 1003 ¶ 256). This reasoning is persuasive and is not contested by Patent Owner.

c. Element 1.2

With respect to element 1.2, which recites "code for causing a determination as to whether a storage resource is available," Petitioner argues that the "data buffer" in each node of the OSEK/VDX system is a storage resource. *Id.* at 18–19 (citing Ex. 1009, 9–10). According to Petitioner, "each node 'is actively monitored by every other node in the network' to determine whether another node, and consequently the storage resource [i.e., data buffer] is available." *Id.* at 19–20 (citing Ex. 1009, 8–10, 49).

In advancing this argument, Petitioner makes the statement that "[w]hen operating in normal mode, each node determines that another node is 'alive' and available by receiving any message from another node following the algorithm shown in [Figure 32 of OSEK NM]." *Id.* at 19. Patent Owner disputes the statement, arguing that "an 'alive' message is clearly not used to determine if a resource is available" because "OSEK explicitly states that '[a]n alive message introduces a new transmitter to the logical ring.'" PO Resp. 23 (quoting Ex. 1009, 10) (alteration by Patent

Owner). But as Petitioner explains in its Reply, "even assuming that is all an alive message does," the claim limitation is still satisfied because the data buffer of the introduced node is a "storage resource" and the introduced node is also actively monitored by every other node in the network to determine its availability. Reply 11–12 (citing Ex. 1009, 8–10; Pet. 18–19). We agree with this argument and find it properly responsive to Patent Owner's argument.

d. Element 1.3

For element 1.3, "code for determining whether a threshold has been reached and causing a request in connection with the storage resource if the threshold has not been reached," Petitioner relies on disclosure in OSEK NM of receiving periodic messages from a node indicating the node is available and able to store data; and that if such message is not received by the node within a specified timeframe, i.e., if the threshold has been reached, the node is determined to be unavailable. Pet. 20–21 (citing Ex. 1009, 9–10, 24–26, 45, 47, 52, Figs. 11, 14, 29, 30, 35). Notably, if the specified timeframe is exceeded, a timer resets; and if a message is received after the reset but before the timeframe is exceeded again, i.e., if the threshold has not been reached, a "re-request in connection with the storage resource" is made. *Id.* at 21–22 (citing Ex. 1009, 25, 52, Fig. 35). Petitioner relies on the "re-request" as the recited "request in connection with the storage resource if the threshold has not been reached." *Id.*

Patent Owner disputes this analysis, arguing that "Petitioner relies on an inversion of the disclosed OSEK/VDX process of monitoring the logical ring." PO Resp. 24. Patent Owner characterizes Petitioner's argument as "point[ing] directly to ***receipt*** of a message as evidence for disclosure of ***issuing*** another storage request." *Id.* We agree with Petitioner that Patent Owner's argument "imposes an additional requirement not recited in the plain language of element 1.3." Reply 12. In particular, that element does not state where or how the request and determination are made, so requesting a node to make a determination of the availability of another node based on messages received from that node falls within the scope of the claim element. Thus, we agree with Petitioner's arguments as to this element and find they refute Patent Owner's argument.

e. Element 1.4

For element 1.4, which recites "code for, in the event the threshold has been reached, causing an error notification to be sent," Petitioner relies on OSEK NM's disclosure that, upon a time-out of T_{Error} (i.e., in the event a threshold has been reached), a "LimpHome" message (i.e., an "error notification") is transmitted. Pet. 22–23 (citing Ex. 1009, 25, Fig. 35). We find that Petitioner adequately identifies disclosure of the limitation in the cited art, and Patent Owner does not dispute this aspect of Petitioner's analysis.

f. Element 1.5

For element 1.5, which recites "code for, in the event the storage resource is available, causing storage of the information utilizing the storage resource," Petitioner argues that OSEK NM teaches that if T_{Error} has not occurred and a node is available, a message is received by the node and the data in the message are stored in a data buffer (i.e., information is stored in the storage resource). Pet. 23–25 (citing Ex. 1009, 11, 20, 52, Figs. 4, 35). We find that Petitioner adequately identifies disclosure of the limitation in the cited art, and Patent Owner does not dispute this aspect of Petitioner's analysis.

g. Elements 1.6–1.8

For element 1.6, which recites "code for causing the information to be shared," Petitioner asserts that "OSEK/VDX discloses sharing message data that a node receives from a logical predecessor with a logical successor." Pet. 25 (citing Ex. 1009, 11, 20, Fig. 4).

For element 1.7, which recites "in real-time, sharing the information utilizing at least one message format corresponding to a second network protocol associated with a second network," Petitioner relies on disclosure in OSEK NM that shared messages are received by logical successors from logical predecessors within predetermined time T_{Typ} of 70 milliseconds, where we have construed "real-time" as including "responses that occur in less than one second." *Id.* at 26 (citing Ex. 1009, 20–22, 60, Fig. 10).

Petitioner also relies on disclosure in OSEK NM relating to the various busses that may be connected to the micro controller. *Id.* at 27 (citing Ex. 1009, 7, Fig. 1). For example, a node may receive messages from a first network that is a low-speed CAN network, and transmit the messages to a second network that is a high-speed CAN network. *Id.* at 28–29 (citing Ex. 1009, 8; Ex. 1008, 111–112).

For element 1.8, which recites "wherein the computer program product is associated with an electronic control unit with a plurality of interface portions," Petitioner relies, in pertinent part, on OSEK Binding's disclosure of a gateway ECU that includes a plurality of interface portions that interface with Networks 1 through k. *Id.* at 30–31 (citing Ex. 1007, 6, Figs. 1–2).

Patent Owner disputes Petitioner's analysis with respect to these limitations, arguing that Petitioner

> ignores that the limitation specifically references "the information," which is the "information associated with a message received utilizing a first network protocol associated with a first network" (limitation 1.1) which was caused to be stored utilizing the storage resource (limitation 1.6[7]) – i.e., it is information whose storage was completed to the bulletin board or the storage resource.

PO Resp. 25. This is essentially the same argument that we address in detail above as a matter of claim construction. As we explain there, the plain

[7] Patent Owner appears to intend to refer to limitation 1.5.

language of the claims, intrinsic evidence in the form of the Specification, and extrinsic evidence in the form of a technical-dictionary definition supports a construction of information sharing that does not require storage of the information. In advancing this argument with respect to elements 1.7 and 1.8, Patent Owner improperly seeks to import certain specific embodiments described in the Specification into the claims. But "[i]t is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude." *Phillips*, 415 F.3d at 1323 (citing *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). The claims are "the sole measure of the grant." *Innova/Pure Water, Inc.*, 381 F.3d at 1115 (citing *Aro Mfg. Co. v. Convertible Top Replacement Co.*, 365 U.S. 336, 339 (1961)).

In addition, Patent Owner disputes Petitioner's identification of separate networks, asserting that "[n]othing in OSEK suggests that the 'logical predecessor' and 'logical successor' can be different networks." PO Resp. 26–27. According to Patent Owner, "there is no second network." *Id.* at 27. We are not persuaded by this argument in light of OSEK NM's teaching that "[a] micro processor with two communication modules connected to two different communication media (e.g., low speed CAN and a high speed CAN) represents two nodes from the OSEK point of view." Ex. 1009, 8. This disclosure is consistent with Petitioner's position that messages are shared among networks with different protocols, particularly in

light of OSEK NM's further disclosure that "[a]ny node must be able to send NM messages to all other nodes and receive messages from them." *Id.* at 9.

We find that Petitioner sufficiently identifies the limitations as taught in the prior art, and we are not persuaded by Patent Owner's arguments, for the reasons discussed more thoroughly above in connection with claim construction.

h. Elements 1.9 and 1.10

In its analysis of the remaining limitations, Petitioner points to Figure 1 of OSEK NM, reproduced below, and related disclosure that describes a data link layer for interfacing with the underlying network. *See* Pet. 33.

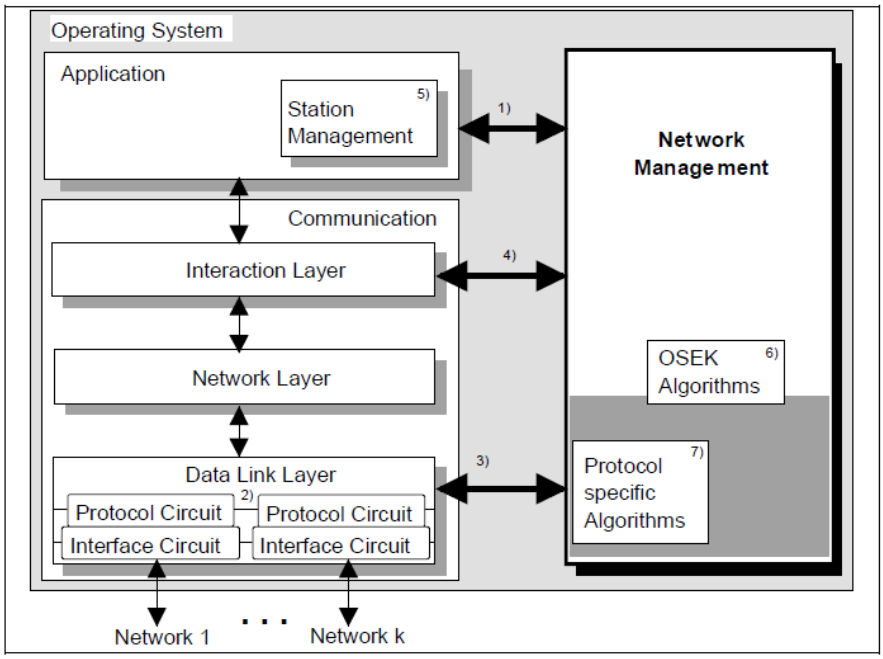


Figure 1 interface and algorithms responsibility

Figure 1 illustrates "interface and algorithms responsibility" of an ECU microcontroller with multiple interfaces shown in the "Data Link Layer" ("DLL") in the lower left of the drawing. Ex. 1009, 7. To address the specific structure for the interfaces recited in limitations 1.9 and 1.10, Petitioner provides an annotated drawing that makes correspondences between the "first interface portion" and communication to "Network 1," and similarly between the "second interface portion" and communication to "Network k." Pet. 36. Petitioner further argues that the recited "first layer part for receiving . . . first layer messages" of the interface portion corresponds to the Interface Circuit in the DLL, and that the recited "second layer part" corresponds to the Protocol Circuit in the DLL. *Id.* For the requirement that the first layer messages are processed, after which second layer messages are provided, Petitioner relies on disclosure in OSEK COM and OSEK NM that DLL Interface Circuits receive messages (i.e., first layer messages are received) and transfer them to the network layer via the Protocol Circuit (i.e., second layer messages are provided). *Id.* at 32 (citing Ex. 1008, 15; Ex. 1009, 7, 20, Figs. 1, 9).

Patent Owner does not dispute these identifications, which we find persuasive.

i. Summary

We are persuaded by Petitioner's showing that the combination of references referred to herein as OSEK/VDX would have suggested the

limitations of claim 1 and that the combination would have been obvious, for the reasons provided by Petitioner and summarized herein. Accordingly, we conclude Petitioner has shown, by a preponderance of the evidence, that claim 1 is unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

2. Claim 2

Claim 2 depends from claim 1 and recites that "the computer program product is operable such that the determination as to whether the storage resource is available is made utilizing an initial request in connection with the storage resource." Ex. 1001, 12:64–67. For this limitation, Petitioner observes that OSEK NM describes each node as having a "data buffer" (corresponding to the recited "storage resource") and each node as "actively monitored by every other node in the network" to determine availability. Pet. 38–39; Ex. 1009, 9–10. In addition, Petitioner identifies disclosure in OSEK NM of a set of timers that determine when to send requests and error notifications to other nodes. Pet. 39 (citing Ex. 1009, 24–25). Based on Petitioner's persuasive mapping of the subject matter of claim 2 to the disclosures of OSEK/VDX, we find Petitioner makes a sufficient showing that claim 2 would have been obvious over OSEK/VDX. Petitioner's showing is not contested by Patent Owner outside of its arguments directed at underlying claim 1.

We conclude that Petitioner shows, by a preponderance of the evidence, that claim 2 is unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

3. Claims 3–8

Claim 3 depends from claim 1 and recites that "the computer program product is operable such that the storage resource includes a bulletin board resource." Ex. 1001, 13:2–4. According to the Specification of the '843 patent, "the bulletin board may refer to any database that enables users to send and/or read electronic messages, files, and/or other data that are of general interest and/or addressed to no particular person/process." *Id.* at 5:9–13.

For the limitation of claim 3, Petitioner identifies a message storage structure in OSEK FTCom in which messages are shared by different tasks. Pet. 41 (citing Ex. 1010,[8] 12, Fig. 3-1). Petitioner alternatively identifies a "ring data buffer" in OSEK NM as a Network Management structure for storing ring messages and for data exchange among different applications. *Id.* (citing Ex. 1009, 20–21, Fig. 10). In light of the Specification's explanation of a "bulletin board," we agree with Petitioner that "[t]he ring data buffer therefore is a bulletin board," and find that Petitioner thus makes a sufficient showing that the subject matter of claim 3 would have been obvious over OSEK/VDX. *See id.* (citing Ex. 1003 ¶ 293).

[8] Petitioner's citation to Ex. 1009 appears to be a typographical error.

Claims 4–6 each depend from claim 1 and respectively recite similar features, namely that the computer program product is operable such that the storage resource "includes a shared memory," "stores messages that are addressed to no particular process," and "stores messages available by any number of processes." Ex. 1001, 13:5–17. That is, we agree with Petitioner that these features are aspects both of the message storage structure shown in OSEK FTCom and the ring data buffer in OSEK NM. We find that Petitioner thus makes a sufficient showing that the subject matter of claims 4–6 would have been obvious over OSEK/VDX.

Claims 7 and 8 each depend from claim 1 and respectively recite that the computer program product is operable such that the storage resource "is a section of a storage" and "involves a database." Ex. 1001, 13:14–24. Petitioner contends that these limitations are met by OSEK/VDX because the ring data buffer of OSEK NM is part of a node for data storage and also a database that provides organized and structured access to information. Pet. 44. We agree with these contentions. We find that Petitioner thus makes a sufficient showing that the subject matter of claims 7 and 8 would have been obvious over OSEK/VDX. Patent Owner does not contest these aspects of Petitioner's analysis with respect to any of claims 3–8.

We conclude that Petitioner shows, by a preponderance of the evidence, that claims 3–8 are unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

4. Claims 9, 10, 12, and 13

Claims 9, 10, 12, and 13 each depend from claim 1 and respectively recite that the computer program product is operable such that the request is "a re-request," "a storage resource request," "another storage resource request," and "for access to the storage resource." Ex. 1001, 13:25–30, 13:36–44. As discussed above in connection with element 1.2 of independent claim 1, OSEK NM discloses receipt of periodic messages from nodes indicating that the node is available and able to store data. Petitioner reasons that such features correspond to the request being "a storage resource request," as recited in claim 10, and "for access to the storage resource," as recited in claim 13. Pet. 44–45. We agree, and Patent Owner does not contest these aspects of Petitioner's analysis.

In addition, OSEK NM discloses a set of timers T_{Typ}, T_{Max}, T_{Error}, and T_{Tx} that determine when to send requests and error notifications to other nodes. Ex. 1009, 25–26. In particular, T_{Tx} is the "delay to repeat the transmission request of a NM message if the preceding request was rejected." *Id.* at 26. Petitioner reasons, and we agree, that these aspects of OSEK NM thus disclose that the request is "a re-request" or "another storage resource request" as recited in claims 9 and 12. Patent Owner does not contest this aspect of Petitioner's analysis.

We conclude that Petitioner shows, by a preponderance of the evidence, that claims 9, 10, 12, and 13 are unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

5. Claim 11

Claim 11 depends from claim 1 and recites that "the computer program product is operable such that the request is repeated until the storage resource is available unless a certain time beyond the threshold has elapsed." Ex. 1001, 13:32–35. Similar to its analysis of element 1.4 of independent claim 1, discussed above, Petitioner relies for its analysis of claim 11 on OSEK NM's disclosure of the T_{Error} timer and the NMLimpHome mode, in which a node determines whether T_{Error} has expired. Pet. 47. We agree with Petitioner that this aspect of OSEK NM at least suggests repeating the request until the storage resource (i.e., the node in OSEK NM) is available unless a threshold has elapsed. *See id.* at 48 (citing Ex. 1003 ¶ 303). Thus, we find that Petitioner makes a sufficient showing that the subject matter of claim 11 would have been obvious over OSEK/VDX. Patent Owner does not contest this aspect of Petitioner's analysis.

We conclude that Petitioner shows, by a preponderance of the evidence, that claim 11 is unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

6. Claims 14 and 15

Claims 14 and 15 each depend from independent claim 1 and recite that the computer program product is operable such that the determining, causing, and threshold are each associated with "a same layer of processing"

and "a middleware layer that sits under an application layer." Ex. 1001, 13:45–53. For these limitations, Petitioner relies on Figure 1 of OSEK NM, reproduced above in discussing elements 1.9 and 1.10 of independent claim 1, and illustrating various processing layers. *See* Ex. 1009, 8, Fig. 1. As Petitioner asserts, the "node monitoring algorithms are associated with network and interaction layers, both of which are part of the same 'middleware layer' that sits under the 'application layer.'" Pet. 48. We find that Petitioner makes a sufficient showing that the subject matter of claims 14 and 15 would have been obvious over OSEK/VDX.

Patent Owner does not contest this aspect of Petitioner's analysis, and we conclude that Petitioner shows, by a preponderance of the evidence, that claims 14 and 15 are unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

7. Claim 16

Claim 16 depends from claim 1 and recites that the computer program product is operable such that "the sharing includes providing the information to a plurality of software or hardware operations that share the storage resource." Ex. 1001, 13:55–59. For this limitation, Petitioner refers again to the message structure described in OSEK FTCom and the ring data buffer in OSEK NM. Pet. 49–50 (citing Ex. 1009, 20–21, Fig. 10; Ex. 1010, 12, Fig. 3-1). In addition, Petitioner refers to Figure 2-3 of OSEK COM as showing that messages can be accessed and shared by different tasks. *Id.* at 50; Ex.

1008, 27, Fig. 2-3. We agree with Petitioner that these features show that "[t]he 'tasks' and 'applications' are performed by hardware or software," and Patent Owner does not dispute this.

We conclude that Petitioner shows, by a preponderance of the evidence, that claim 16 is unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

8. Claim 17

Claim 17 depends from claim 1 and recites that the computer program product is operable such that "the electronic control unit is equipped with at least one gateway function." Ex. 1001, 13:61–63. For this limitation, Petitioner refers to the labelled electronic communication unit in Figure 2 of OSEK NM, reproduced above in the discussion of element 1.1 of independent claim 1, and contends that it acts as a gateway, supported by testimony of Dr. Madisetti. Pet. 50–51 (citing Ex. 1009, 9; Ex. 1003 ¶ 309). We agree, and find that Petitioner makes a sufficient showing that the subject matter of claim 17 would have been obvious over OSEK/VDX. Patent Owner does not dispute this aspect of Petitioner's analysis.

We conclude that Petitioner shows, by a preponderance of the evidence, that claim 17 is unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

9. Claims 18 and 20

Claims 18 and 20 each depend from claim 1 and respectively recite that the computer program product is operable such that the real-time involves a response time that "is measured in milliseconds" and "is less than 1 second." Ex. 1001, 13:65–67, 14:6–8. Petitioner addresses these limitations with OSEK NM's disclosure of an example in which T_{Typ}, the time within which the sharing occurs, is described as "70*ms*," satisfying the limitations of both claims. *Id.* at 52–53. We find Petitioner makes a sufficient showing that the subject matter of claims 18 and 20 would have been obvious over OSEK/VDX. Patent Owner does not dispute this aspect of Petitioner's analysis.

We conclude that Petitioner shows, by a preponderance of the evidence, that claims 18 and 20 are unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

10. Claim 21

Claim 21 depends from claim 1 and recites that the computer program product is operable such that "the first network or the second network is of the Controller Area Network type." Ex. 1001, 14:11–13. Petitioner addresses this limitation with OSEK NM's disclosure that Network 1 can be one of a number of different network types, including "CAN, VAN, J1850, K-BUS, [and] D2B." Pet. 53; Ex. 1009, 7. We agree, and find Petitioner makes a sufficient showing that the subject matter of claim 21 would have

been obvious over OSEK/VDX. Patent Owner does not dispute this aspect of Petitioner's analysis.

We conclude that Petitioner shows, by a preponderance of the evidence, that claim 21 is unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

11. Claim 24

Claim 24 depends from claim 1 and recites specific structure for each of the interface-related layer parts. Specifically, the claim requires that "the first interface-related first layer part or the second interface-related first layer part include[] at least one of a controller, a communication interface, or an operating system interface"; and the claim requires that "the first interface-related second layer part or the second interface-related second layer part include[] at least one of a remote message conversion layer, a communication interface, or an operating system interface." Ex. 1001, 14:22–31. Petitioner focuses on the "communication interface" recited within each of the two limitations, and the correspondences discussed above in connection with limitations 1.9 and 1.10 of independent claim 1. Because those identified parts receive or transmit messages, Petitioner contends that each of them is at least "a communication interface." Pet. 53–55. We agree, find Petitioner makes a sufficient showing that the subject matter of claim 24 would have been obvious over OSEK/VDX. Patent Owner does not dispute this aspect of Petitioner's analysis.

We conclude that Petitioner shows, by a preponderance of the evidence, that claim 24 is unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

12. Claim 25

Claim 25 depends from claim 1 and recites that the computer program product is operable such that "the first interface portion and the second interface portion are each separate portions of a same apparatus." Ex. 1001, 14:34–37. We agree with Petitioner that Figure 1 of OSEK NM, reproduced above, shows the two interface portions, i.e., the two sets of "Protocol Circuit" and "Interface Circuit," as separate portions of the same apparatus, i.e., the Data Link Layer. Pet. 57. Accordingly, we find Petitioner makes a sufficient showing that the subject matter of claim 25 would have been obvious over OSEK/VDX. Patent Owner does not dispute this aspect of Petitioner's analysis.

We conclude that Petitioner shows, by a preponderance of the evidence, that claim 25 is unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

13. Claims 26–30

Claims 26–30 each depend from claim 1 and recite that the computer program product is operable such that "the first network and the second network are heterogeneous networks," and certain variations requiring that

the second network protocol (and a third network protocol in the case of claim 30) be different than the first network protocol. Ex. 1001, 14:38–15:3. Petitioner addresses these limitations by observing that each CAN bus disclosed in OSEK NM can be low-speed or high-speed, "which have different protocols and different physical implementations." Pet. 58 (citing Ex. 1009, 8; Ex. 1012, 64). In light of these differences, Petitioner provides persuasive reasoning that each of the various limitations requiring different network protocols are met by the OSEK/VDX disclosures. *Id.* at 57–60.

Patent Owner disputes this analysis with an argument that generally parallels its argument for independent claim 1. That is, Patent Owner contends that, because element 1.7 of independent claim 1 recites "a second network protocol" used for "sharing the information," "claims 27-29 require that the first messages stored in the storage resource be converted to a message format of a different protocol." PO Resp. 29–31. Patent Owner makes a similar argument for claim 30. *Id.* at 31–32 ("The arguments fail for the same reason as above . . . ."). For reasons discussed in depth above in connection with claim 1, Patent Owner's arguments are not persuasive because they are not commensurate with the scope of the claim. The plain language of independent claim 1, from which each of claims 26–30 depends, does not require storage in order to share the information, and the Specification of the '843 patent treats storage and sharing as distinct operations.

We conclude that Petitioner shows, by a preponderance of the evidence, that claims 26–30 are unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

14. Claims 31–34

Claim 31 depends from claim 1 and recites that the computer program product is operable such that the storage resource "is protected utilizing semaphores." Ex. 1001, 15:6–7. Claims 32–34 depend from claim 31 and respectively recite heterogeneous networks, information storage in response to interrupts, and updating of information at different rates. *Id.* at 15:8–24.

For the limitation of claim 31, Petitioner persuasively refers to express disclosure in OSEK FTCom of "a two message buffer/semaphore implementation concept," thereby making a sufficient showing that is not separately disputed by Patent Owner. Pet. 60; Ex. 1010, 32.

For the limitation of claim 32, Petitioner relies on the disclosure of heterogeneous networks discussed above for claims 26–30. Pet. 60–61. Citing OSEK FTCom, in which application software and FTCom Layer are executed under control of an operating system, with executed processes independent of the underlying network, Petitioner persuasively reasons that the information is processed by at least one of the processes in a manner independent of the temporal behavior of at least one underlying network. *Id.* This reasoning is consistent with our adopted construction of "isolated from temporal characteristics," and undisputed by Patent Owner.

For the limitation of claim 33, Petitioner persuasively observes that OSEK FTCom discloses that the operating system core offers all basic services for real-time application, including interrupt handling. *Id.* at 61–62. Patent Owner does not separately dispute Petitioner's persuasive reasoning that, because the interrupts are generated for different layers and tasks, the information is stored "in response to interrupts associated with the different processes," as required by the claim.

For the limitation of claim 34, Petitioner relies on the fact that different CAN busses may be low-speed or high-speed, thereby transmitting and receiving data at different rates. *Id.* at 62–63. Petitioner persuasively reasons that different processes are therefore "updated with the information at a first rate that differs from a second rate with which the different processes send the information to the storage resource," as required by the claim. *Id.* This reasoning is not separately disputed by Patent Owner, and is a sufficient showing.

We conclude that Petitioner shows, by a preponderance of the evidence, that claims 31–34 are unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

15. Claim 35

Claim 35 depends from claim 1 and recites that the computer program product is operable such that "the storage resource is operable so as not to require a network layer translation of messages." Ex. 1001, 15:27–28. For

this limitation, Petitioner observes that OSEK NM discloses receiving messages from the various networks via the DLL, which then transmits the messages to the network layer. Pet. 64 (citing Ex. 1009, Fig. 1). Petitioner thereby reasons that "[d]uring the processing of the network layer, no network information needs to be removed from the messages," and, therefore, "there is no need of network layer translation." *Id.* Petitioner makes a sufficient showing with this persuasive reasoning and evidence, which is not separately disputed by Patent Owner.

We conclude that Petitioner shows, by a preponderance of the evidence, that claim 35 is unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

16. Claims 36 and 37

Claims 36 and 37 each depend from claim 1 and respectively recite that the computer program product is operable such that "the threshold includes a timeout" and "the threshold includes a time-related threshold." Ex. 1001, 15:29–35. For these limitations, similar to element 1.4 of independent claim 1, discussed above, Petitioner relies on OSEK NM's disclosure of the T_{Error} timer and the NMLimpHome mode, in which a node determines whether T_{Error} has expired. Pet. 64–65. We are persuaded by Petitioner's argument that these aspects of the prior art meet the claim limitations, and Patent Owner does not separately dispute Petitioner's reasoning.

We conclude that claims 36 and 37 are unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

17. Claims 38 and 41

Claims 38 and 41 each depend from claim 1 and recite that messages include protocol data units. Ex. 1001, 15:36–42, 15:56–59. Petitioner observes that OSEK COM expressly discloses "network protocol data unit (NPDU) consists of various fields that enable each protocol entity to operate in conformance with a set of communication rules." Pet. 65–66; Ex. 1008, 96. And OSEK NM discloses "NM protocol data unit (NMPDU)." Pet. 66; Ex. 1009, 16. In light of these disclosures, Petitioner makes a sufficient showing, which Patent Owner does not separately dispute.

We conclude that claims 38 and 41 are unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

18. Claims 39 and 42

Claims 39 and 42 each depend from claim 1 and recite that messages include headers. Ex. 1001, 15:43–47, 15:60–62. Petitioner observes that OSEK NM discloses that messages, such as CAN messages, have headers. Pet. 66; Ex. 1009, 18, Figs. 7, 125. In addition, Petitioner addresses the requirement of claim 39 that "the first interface-related first layer messages and the first interface-related second layer messages are different in terms of at least one aspect of headers thereof" by persuasively observing that

"[n]etwork and middleware layers handle different operations and processes, so they necessarily have different headers." Pet. 67 (citing Ex. 1003 ¶ 344; Ex. 1001, 6:43–46). In particular, OSEK NM discloses encoding and decoding of an NMPDU, including the header of the message. Ex. 1009, 125–126, Fig. 74. We find Petitioner makes a sufficient showing that the subject matter of claims 39 and 42 would have been obvious over OSEK/VDX. Patent Owner does not separately dispute this aspect of Petitioner's analysis.

We conclude that Petitioner shows, by a preponderance of the evidence, that claims 39 and 42 are unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

19. Claim 40

Claim 40 depends from claim 1 and recites that "the processing includes conversion" and that "the first interface-related second layer part carries out the processing of the first interface-related first layer messages." Ex. 1001, 15:48–55. Petitioner contends that such processing is disclosed by OSEK NM, in which messages are transferred to the "Protocol Circuit" after the messages are received by the "Interface Circuit," as illustrated in Figure 1 of OSEK NM, reproduced above. Pet. 69. Such processing is consistent with the claim limitation, and we find Petitioner's evidence and reasoning, which is not separately disputed by Patent Owner, to be persuasive.

We conclude that Petitioner shows, by a preponderance of the evidence, that claim 40 is unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

20. Claim 43

Claim 43 depends from claim 1 and recites that the computer program product is operable such that "the first interface-related first layer part is associated with a layer that is below another layer associated [with] the first interface-related second layer part." Ex. 1001, 15:65–67. Petitioner addresses this limitation by referring to OSEK NM's disclosure of receiving bus messages from the networks through the interface circuit (i.e., the "first layer part") of the DLL and processing the messages by the protocol circuit (i.e., the "second layer part"), and then transmitting the messages to the network layer. Pet. 70 (citing Ex. 1009, 7, Fig. 1). This structure is consistent with the claim language, and we accordingly find Petitioner's contention persuasive. This aspect of Petitioner's analysis is not separately disputed by Patent Owner.

We conclude that Petitioner shows, by a preponderance of the evidence, that claim 43 is unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

21. Claims 44 and 45

Claims 44 and 45 depend from claim 1 and respectively recite that the computer program product is operable such that the first interface-related second layer messages and the second interface-related first layer messages "have a same format" and "are a same messages." Ex. 1001, 16:1–10. As previously noted, each CAN bus may be low-speed or high-speed, which are different protocols and physical implementations. Petitioner thereby reasons that messages received from Network 1 in OSEK NM must be converted to messages in the format associated with Network 2 so that they match with messages received from Network 2. Pet. 71. Accordingly, and supported by the testimony of Dr. Madisetti, Petitioner persuasively contends that the messages have a same format or are the same messages, as required by the claims. *Id.* Patent Owner does not separately dispute this aspect of Petitioner's analysis, which we find sufficient.

We conclude that Petitioner shows, by a preponderance of the evidence, that claims 44 and 45 are unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

22. Claim 46

Claim 46 depends from claim 1 and recites that the computer program product is operable such that "a waiting period is implemented between re-requests for the storage resource." Ex. 1001, 16:11–14. Relying again on the timing arrangement of OSEK NM, and particularly on the timer T_{Tx},

which is the "delay to repeat the transmission request of a NM message if the preceding request was rejected," Petitioner contends that the prior art discloses the recited waiting period. Pet. 72–73. Petitioner's evidence and reasoning are sufficient, and not separately disputed by Patent Owner.

We conclude that claim 46 is unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

23. Claim 47

Independent claim 47 is a method claim that substantially parallels computer-readable medium claim 1. Ex. 1001, 16:15–50. Petitioner contends that claim 47 is therefore unpatentable "[f]or the same reasons" as claim 1, and Patent Owner similarly relies only on arguments directed at claim 1 and addressed above. Pet. 74; PO Resp. 33–34. Because we find that Petitioner makes a sufficient showing with respect to claim 1, we also find that Petitioner makes a sufficient showing with respect to claim 47.

We conclude that Petitioner shows, by a preponderance of the evidence, that claim 47 is unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

24. Claim 48

Independent claim 48 includes many limitations that have evident counterparts in independent claim 1. We have reviewed Petitioner's analysis of claim 48, and find it sufficient. *See* Pet. 74–88. Patent Owner's

arguments are also similar to those it makes in connection with claim 1, and we therefore address them briefly. *See* PO Resp. 34–41.

First, Patent Owner disputes Petitioner's showing with respect to element 48.2, which recites "computer code for causing a determination as to whether a storage resource is available." *Id.* at 37–39. Specifically, Patent Owner contends that "[j]ust as discussed with respect to Limitation 1.2 . . . , Petitioner has failed to distinguish between 'alive' and 'awake.'" *Id.* at 38. This argument is unpersuasive for the reasons we discuss above with regard to element 1.2 of claim 1.

Second, Patent Owner disputes Petitioner's showing with respect to element 48.4, which recites "code for, when the storage resource is not available and the threshold associated with the determination whether the storage resource is available has not been reached, issuing another storage resource request in connection with the storage resource." *Id.* at 39–40. Again, Patent Owner contends that "[j]ust as detailed above [for element 1.3], OSEK does not disclose limitation 48.4." *Id.* at 39. We disagree, for the reasons detailed above in discussing element 1.3 of claim 1.

Third, Patent Owner disputes Petitioner's showing with respect to element 48.7, which recites "wherein the computer program product is operable such that the information is capable of being shared in real-time utilizing a control unit that includes a plurality of interfaces." *Id.* at 40–41. In disputing Petitioner's showing, Patent Owner argues that OSEK/VDX "only describes sharing messages within a given ring," not among networks,

and refers to its analysis of elements 1.7 and 1.8. *Id.* The relevance of this argument to element 48.7 is not entirely clear. Nevertheless, for the reasons provided above in our discussion of elements 1.7 and 1.8 of claim 1, we find, contrary to Patent Owner's position, that OSEK/VDX discloses sharing information from a first network with a second network.

We conclude that Petitioner shows, by a preponderance of the evidence, that claim 48 is unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

25. Claim 49

Petitioner characterizes independent claim 49 as including elements "that are substantially identical to or broader than elements" of independent claim 1. Pet. 88–89. We agree with this characterization, and Patent Owner advances no arguments different from those made in connection with claim 1. Because we find that Petitioner makes a sufficient showing with respect to claim 1, we also find that Petitioner makes a sufficient showing with respect to claim 49.

We accordingly conclude that Petitioner shows, by a preponderance of the evidence, that claim 49 is unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

26. Claim 50

Independent claim 50 recites an "apparatus" with an "electronic control unit configured" to perform steps that are, as Petitioner, asserts "substantially identical to or broader than elements 1.1-1.10," which are performed by code. Ex. 1001, 17:60–18:28; Pet. 90. Petitioner persuasively addresses the recited "electronic control unit" by observing that such a structure is taught in Figure 2 of OSEK NM, and otherwise relying on its analysis of claim 1. Pet. 89–91. Patent Owner does not advance any arguments different from those made in connection with claim 1. Because we find that Petitioner makes a sufficient showing as to the "electronic control unit" recited in claim 50, and otherwise makes a sufficient showing with respect to the substantially identical elements of claim 1, as noted above, we also find that Petitioner makes a sufficient showing with respect to claim 50.

Accordingly, we conclude that Petitioner shows, by a preponderance of the evidence, that claim 50 is unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX.

H. Obviousness Over OSEK/VDX, Millsap, and Wong

Petitioner challenges claims 1–18 and 20–50 as unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX, Millsap, and Wong. Pet. 91–99. For claims 1–18, 20, 21, and 24–50, Petitioner relies on its analysis over OSEK/VDX, but contends that "[t]o the extent OSEK/VDX does not disclose elements 1.8-1.10 and 48.7-48.9, OSEK/VDX combined with *Millsap* and *Wong* does." Pet. 91 (citing Ex. 1003 ¶ 397), 97, 98–99. For claims 22 and 23, Petitioner additionally relies on Wong for the specifically recited limitations.

1. Millsap

Millsap "relates to networks used in vehicles to provide distributed control of various vehicle functions and, more particularly, to such networks which utilize different groupings of electronic control units (ECUs) to carry out different control tasks." Ex. 1015, 1:6–10. In particular, Millsap describes "an on-board vehicle network which utilizes a network management strategy that permits distributed ECUs on the network." *Id.* at 2:27–33.

Figure 9 of Millsap is reproduced below.

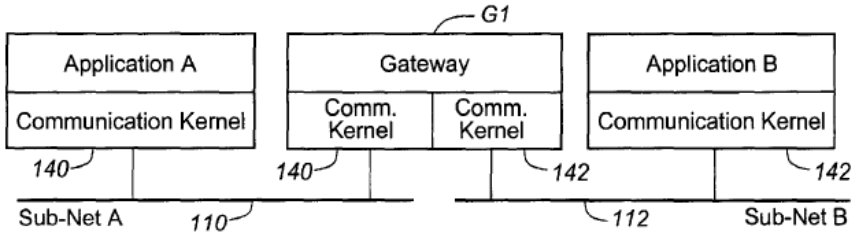


Fig. 9

Figure 9 depicts Gateway G1 comprising two interfaces, Comm. Kernel 140 ("communication kernel") and Comm. Kernel 142, connected to two different networks, SubNet A and SubNet B. *Id.* at 13:22–27. SubNet A is connected via high-speed bus 110, and SubNet B is connected via low-speed bus 112. *Id.* at 12:27–30. Each communication kernel includes a data link layer ("DLL") and a physical layer that provides conversion of digital data symbols (i.e., 1's and 0's) generated by the data link layer into electrical signals transmitted on the bus. *Id.* at 12:42–51.

2. Wong

Wong, like Millsap and the Specification of the '843 patent, describes network communications in automobiles. Ex. 1012, 62. Wong discloses that "[v]ehicles will be home for some of the most diverse network and multiprocessing technology over the next five years," and that "[s]tandards will help improve acceptance and reduce costs." *Id.* "Leading the standardization charge for networks in automotive environments is the Controller Area Network (CAN) . . . providing a standard for real-time

operating systems for the many embedded processors found in automotive networks." *Id.*

Wong discloses further that CAN is not the only kind of network used in automobiles. "At the low end, the Local Interconnect Network (LIN) is being employed," and "[a] variety of multimedia networks are undergoing evaluation too, including a modified version of the IEEE-1394 standard to allow operation in a more hostile environment." *Id.* Wong provides a table listing various automobile networking standards, including, for example, CAN, CAN-A, CAN-B, CAN-C, LIN, and FlexRay. *Id.* at 66. According to Wong, "[t]he vehicle of the future will contain a variety of networks tied together primarily for management and diagnostic support. . . . One or more gateways will link various network segments." *Id.* at 64 (Fig. 1).

3. Independent Claims 1 and 48

In its challenge of independent claims 1 and 48, Petitioner relies mostly on OSEK/VDX, and in particular, its arguments and evidence based on OSEK/VDX alone. Pet. 91. But Petitioner includes argument that elements 1.8–1.10 of claim 1, and corresponding elements 48.7–48.9 of claim 48, also would have been obvious over the combination of OSEK/VDX with Millsap and Wong. *Id.* at 91–96.

In particular, Petitioner relies on Millsap's disclosure of ECUs in vehicle control system networks. *Id.* at 91. Millsap's ECUs are connected to one or more networks. Ex. 1015, 1:6–10, 2:41–46, 12:20–36, 12:42–44,

Fig. 8. Specifically, Petitioner relies on Millsap's disclosure of a gateway ECU comprising two communications kernels connected to different networks as described above. Pet. 91–96.

Petitioner points out that Millsap, like OSEK/VDX, relates to gateway ECUs having software and interface layers, including a physical layer and DLL that passes messages between layers. *Id.* at 92. According to Petitioner, a skilled artisan would have been motivated to incorporate the ECU in Millsap into the OSEK/VDX system to interface between different busses. *Id.* Petitioner enumerates several reasons for effecting the combination, including that (1) they are from the same field, related to real-time distributed communication and control of automotive ECUs; (2) the combination would have been predictable and yielded no unexpected results; and (3) OSEK COM's express direction that other unlisted networks may be used, Ex. 1008, 11 ("This interface is independent of the bus system used hence allowing for application software asset re-use across different bus platforms."). *Id.* at 92–94. Particularly persuasive is Petitioner's argument that OSEK/VDX describes a specific DLL in a multilayer network interface for an ECU, and Millsap describes a DLL that could have been used in its place. *Id.* at 92–93. This reasoning is adequately supported by rational underpinning. *See KSR*, 550 U.S. at 418.

Patent Owner disputes this aspect of Petitioner's analysis, asserting that "Petitioner has attempted to combine several references, using conclusory statements and reference descriptions having a high level of

abstraction." PO Resp. 42 (citing Ex. 2001 ¶¶ 101–111). We disagree that Petitioner's characterizations use an inappropriately "high level of abstraction." Rather, Petitioner's description of the fields of both OSEK/VDX and Millsap as "related to real-time distributed communication and control of automotive ECUs" is both reasonably narrow and accurate. We further disagree with Patent Owner's contention that "Petitioner does not articulate a reason for making the proposed combination" in light of Petitioner's clear proposal that the DLL of Millsap be substituted for the DLL of OSEK/VDX. *Id.* at 43; *see KSR*, 550 U.S. at 416 ("[W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result.").

Petitioner persuasively relies on Wong to support its argument regarding the understanding of a skilled artisan as to which networks, in addition to CAN networks, would have been used in an automobile at the time of the invention. *Id.* at 94–96. Specifically, Petitioner argues that Wong supports its position that a skilled artisan would have understood that such other networks would have included LIN and FlexRay. *Id.* at 94.

Petitioner also provides sufficient rationale for combining Wong with OSEK/VDX and Millsap. *Id.* at 95–96. In pertinent part, OSEK/VDX and Millsap relate to passing messages between different networks in automobiles, and Wong provides a description of various known networks used in automobiles at the time. *Id.* Petitioner persuasively argues the

combination would have yielded predictable results, namely, ensuring support for additional networks and protocols. *Id.* at 96.

Accordingly, having reviewed Petitioner's evidence and arguments, and having considered Patent Owner's arguments, we conclude that Petitioner shows, by a preponderance of the evidence, that independent claims 1 and 48 are unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX, Millsap, and Wong.

4. Dependent Claims 2–18 and 20–46

For the limitations recited in each of dependent claims 2–18, 20, 21, and 24–46, Petitioner relies on its analysis of OSEK/VDX. Pet. 97. Because we find that Petitioner makes a sufficient showing in that analysis, as described above, we similarly conclude that Petitioner makes a sufficient showing in the context of the combination of OSEK/VDX with Millsap and Wong.

For claims 22 and 23, which respectively recite that the computer program product is operable such that the first network or the second network is "of the Flexray network type" and "of the Local Interconnect Network type," Petitioner relies on the express disclosure of such networks in Wong. Pet. 97–98; Ex. 1001, 14:14–21. We agree with Petitioner's analysis and are persuaded Petitioner makes a sufficient showing for these claims.

We conclude that Petitioner shows, by a preponderance of the evidence, that claims 2–18 and 20–46 are unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX, Millsap, and Wong.

5. Independent Claims 47, 49, and 50

As noted above, independent claims 47, 49, and 50 recite limitations that are generally similar to or broader than the limitations of independent claim 1. Petitioner argues that those claims are therefore also unpatentable over OSEK/VDX, Millsap, and Wong, and Patent Owner does not separately argue the limitations of those claims. Pet. 98–99. Because we find that Petitioner makes a sufficient showing with respect to claims 47, 49, and 50, as noted above, in the context of the combination of OSEK/VDX, we also find that Petitioner makes a sufficient showing with respect to claims 47, 49, and 50 in the context of the combination of OSEK/VDX with Millsap and Wong.

We conclude that Petitioner shows, by a preponderance of the evidence, that claims 47, 49, and 50 are unpatentable under 35 U.S.C. § 103(a) over OSEK/VDX, Millsap, and Wong.

I. Constitutionality of Inter Partes Review Proceedings

Patent Owner contends that "this IPR should be terminated and the petition dismissed because the IPR system is unconstitutional." PO Resp. 45–46. This argument is foreclosed by the Supreme Court's determination

otherwise. *Oil States Energy Services, LLC v. Greene's Energy Group, LLC*, 138 S. Ct. 1365, 1370 (2018) ("In this case, we address whether inter partes review violates Article III or the Seventh Amendment of the Constitution. We hold that it violates neither.").

J. Estoppel

Petitioner argues that under 37 C.F.R. § 42.73(d)(3)(i) Patent Owner is estopped from arguing any claim not patentably distinct from those held unpatentable. Reply 2. Rule 42.73(d)(3) states "[a] patent applicant or owner is precluded from taking action inconsistent with the adverse judgment, including obtaining in any patent: (i) [a] claim that is not patentably distinct from a finally refused or canceled claim." Because we conclude that Petitioner has made a sufficient showing with respect to all challenged claims, even considering Patent Owner's arguments, we do not reach this issue.

III. ORDER

It is

ORDERED that, based on a preponderance of the evidence, claims 1–18 and 20–50 of U.S. Patent No. 8,566,843 B2 are held to be unpatentable; and

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

IPR2017-01520
Patent 8,566,843 B2

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