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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte ALEXANDER IVAN SOTO AND WALTER GLEN SOTO

Appeal 2018-008100
Application 14/588,899
Technology Center 2600

BEFORE MICHAEL J. STRAUSS, MICHAEL M. BARRY, and PHILLIP A. BENNETT, *Administrative Patent Judges.*

STRAUSS, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE[1]

Pursuant to 35 U.S.C. § 134(a), Appellant[2] appeals from the Examiner's decision to reject claims 1–22. Final Act. 1. We have jurisdiction under 35 U.S.C. § 6(b).

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[1] We refer to the Specification, filed January 2, 2015 ("Spec."); Final Office Action, mailed October 19, 2016 ("Final Act."); Appeal Brief, filed March 18, 2017 as supplemented on May 8, 2017 ("Appeal Br."); Examiner's Answer, mailed July 12, 2017 ("Ans."); and Reply Brief, filed July 22, 2018 ("Reply Br.").

[2] We use the word Appellant to refer to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as the joint inventors, Alexander Soto and Walter Soto. Appeal Br. 3.

We AFFIRM.

CLAIMED SUBJECT MATTER

The claims are directed to optical layer management in optical modules and remote control of optical modules. Spec., Title. Claim 1, reproduced below, is illustrative of the claimed subject matter:

> 1. A pluggable optical transceiver module configured to removably couple to an optical module port of a switch, router or media adapter, the pluggable optical transceiver module comprising:
>
> a protocol processor for managing the transmission and reception of Open Systems Inter-connect (OSI) Layer 3 communications;
>
> an optical fiber interface port disposed to removably couple one or more optical fibers to the pluggable optical transceiver module;
>
> an electrical network interface port electrically coupled to the protocol processor and disposed for electrically coupling the pluggable optical transceiver module-to a switch, router or media converter;
>
> a bidirectional optical assembly optically coupled to the optical fiber interface port, the bidirectional optical assembly being electrically coupled to the protocol processor and disposed for transmitting optical signals through the optical fiber interface port responsive to electrical signals received from the protocol processor and further disposed to convey an electrical communication signal to the protocol processor responsive to receiving an optical communication signal through the optical fiber interface port, whereby the pluggable optical transceiver module is disposed to communicate using OSI Layer 3.

REFERENCES [3]

The prior art relied upon by the Examiner is:

[3] All citations herein to these references are by reference to the first named inventor only.

Name	Reference	Date
Scarmalis	US 6,229,823 B1	May 8, 2001
Masucci et al.	US 6,498,667 B1	Dec. 24, 2002
Denton et al.	US 6,567,413 B1	May 20, 2003
Medina et al.	US 6,778,399 B2	Aug. 17, 2004
Huang et al.	US 7,031,574 B2	Apr. 18, 2006
Xu et al.	US 7,181,142 B1	Feb. 20, 2007
Johnston et al.	US 7,991,296 B1	Aug. 2, 2011
Ethridge et al.	US 2002/0163921 A1	Nov. 7, 2002
Levinson et al.	US 2003/0053170 A1	Mar. 20, 2003
Song et al.	US 2003/0137975 A1	July 24, 2003
Cox et al.	US 2004/0028408 A1	Feb. 12, 2004
Wang et al.	US 2004/0052274 A1	Mar. 18, 2004
Tan et al.	US 2004/0208601 A1	Oct. 21, 2004

REJECTIONS

Claims 1–3, 10, and 13 stand rejected under pre–AIA 35 U.S.C. § 103(a) as being unpatentable over Levinson, Huang, and Tan. Final Act. 4–8.

Claim 4 stands rejected under pre–AIA 35 U.S.C. § 103(a) as being unpatentable over Levinson, Huang, Tan, Masucci, and Denton. Final Act. 8–9.

Claim 5 stands rejected under pre–AIA 35 U.S.C. § 103(a) as being unpatentable over Levinson, Huang, Tan, and Medina. Final Act. 9–10.

Claims 6 and 8 stand rejected under pre–AIA 35 U.S.C. § 103(a) as being unpatentable over Levinson, Huang, Tan, Song, and Xu. Final Act. 10–12.

Claim 7 stands rejected under pre–AIA 35 U.S.C. § 103(a) as being unpatentable over Levinson, Huang, Tan, and Wang. Final Act. 12–14.

Claim 9 stands rejected under pre–AIA 35 U.S.C. § 103(a) as being unpatentable over Levinson, Huang, Tan, and Johnston. Final Act. 14–15.

Claim 11 stands rejected under pre–AIA 35 U.S.C. § 103(a) as being unpatentable over Levinson, Huang, Tan, and Ethridge. Final Act. 15–16.

Claim 12 stands rejected under pre–AIA 35 U.S.C. § 103(a) as being unpatentable over Levinson, Hung, Tan, Ethridge, and Cox. Final Act. 16–17.

Claims 14 and 20 stand rejected under pre–AIA 35 U.S.C. § 103(a) as being unpatentable over Levinson and Tan. Final Act. 17–20.

Claim 15 stands rejected under pre–AIA 35 U.S.C. § 103(a) as being unpatentable over Levinson, Tan, Masucci, Denton, and Scarmalis. Final Act. 20–23.

Claim 16 stands rejected under pre–AIA 35 U.S.C. § 103(a) as being unpatentable over Levinson, Tan, Masucci, Denton, Scarmalis, and Medina. Final Act. 23.

Claims 17 and 19 stand rejected under pre–AIA 35 U.S.C. § 103(a) as being unpatentable over Levinson, Tan, Song, and Xu. Final Act. 24–25.

Claim 18 stands rejected under pre–AIA 35 U.S.C. § 103(a) as being unpatentable over Levinson, Tan, and Wang. Final Act. 26–27.

Claim 21 stands rejected under pre–AIA 35 U.S.C. § 103(a) as being unpatentable over Levinson, Tan, and Ethridge. Final Act. 27–28.

Claim 22 stands rejected under pre–AIA 35 U.S.C. § 103(a) as being unpatentable over Levinson, Tan, Ethridge, and Cox. Final Act. 28–29.

ANALYSIS

Except as noted, we adopt as our own (1) the findings and reasons set forth by the Examiner in the action from which this appeal is taken (Final Act. 4–29; Ans. 3–29) and (2) the findings and reasons set forth by the

Examiner in the Examiner's Answer in response to Appellant's Appeal Brief (Ans. 29–73) and concur with the conclusions reached by the Examiner. We address Appellant's contentions seriatim as they appear in the Appeal Brief, highlighting the following for emphasis and adopting the Examiner's issue labeling convention for ease of reference.

A–C) Claim 4

> 4. The pluggable optical transceiver module of claim 3, wherein the protocol processor includes an Ethernet MAC [(Media Access Controller)] disposed to enable Ethernet communications between the protocol processor and the switch, router or media converter.

The Examiner finds the limitations of base claim 1 and intermediate claim 3 are taught or suggested by combinations of Levinson, Huang, and Tan. The Examiner applies Masucci and Denton in combination with Levinson for teaching the additional limitations of claim 4.

> Levinson et al. teaches "these programs and instructions contained in memory 222 may be modified by the user(s) such that the optoelectronic device may be reprogrammed to communicate in various network protocols and to perform a variety of operations. By altering the program codes contained in memory 222, additional functionality may be added to the optoelectronic device without altering the interface through which it communicates with the host". And to implement an Ethernet MAC in a transceiver module is known in the art. E.g., Masucci et al discloses that a Ethernet MAC can be installed in a remote terminal (30 in Figure 1), and Denton et al discloses that

> an Ethernet MAC (210 in Figure 2) can be implemented in a protocol processor (Figures 1 and 2).

Final Act. 9 (emphasis omitted).

A. Protocol processor includes an Ethernet MAC

i. Appellant contends "Masucci's remote terminals are traditional [customer premise equipment (CPE)] and there is no suggestion in [Masucci] that his remote terminals are configured to removably couple to an optical module port of a switch, router or media adapter as in Appellant[']s independent claim 1, which claim 4 is dependent on." Appeal Br. 8–9.

Appellant's contention is unpersuasive because it fails to address the Examiner's findings that the argued limitation is taught by the combination of Levinson, Huang, and Tan (the references applied in the rejection of claim 1), further in view of Masucci and Denton, not Masucci standing alone. Final Act. 4, 8. The Examiner finds Huang discloses a plug-in module 208 as shown in Figures 2 and 14 of the reference. *Id.* at 6 (citing Huang Figs. 2, 12–14, col. 19, ll. 19–67). In particular, Huang discloses "receptacle 1430 can accommodate a removable pigtail, small form factor pluggable, GBIC [(Gigabit interface converter)], or any other standard form factor connector." Huang col. 19, ll. 53–55; *see also* col. 3, ll. 35–37[4]. The Examiner further finds "the system disclosed by Tan et al[.] is a pluggable optical transceiver module having a bidirectional optical assembly and removably couple[d] to an optical module port of a switch, router or media

[4] "In still another configuration, the means for optically communicating may include a pigtail that is removably attached or coupled to the module casing." Huang col. 3, ll. 35–37.

adapter." Final Act. 6 (citing Tan ¶ 72)[5].

In still another configuration, the means for optically communicating may include a pigtail that is removably attached or coupled to the module casing. Col. 3, ll. 35–37. Thus, it is the combination of Huang and Tan, in view of the references cited in the rejection of claim 1 (especially Levinson (see Final Act. 8–9)), that teaches or suggests the argued limitation.

ii. Appellant further contends there is "no evidentiary support for the claim by the Examiner that an Ethernet MAC such as Denton's Ethernet MAC (210 in Figure 2) described in Denton as an ASIC [(application-specific integrated circuit)] . . . can be implemented in Levinson merely by 'altering the program codes contained in memory 222' [as alleged by the Examiner[6]]." Appeal Br. 9. Appellant argues implementing the combination by modifying Levinson to incorporate Denton's MAC

> is not an obvious or trivial matter even for one skilled in the arts and Appellants[] merely point out there is a gap in the references to support such a claim made by the Examiner and it is the burden of the Examiner to clearly substantiate such a claim to establish a prima facie case of obviousness.

[5] "Alternatively, the PCB 600 may include pads 610 at an edge or tongue of the PCB 600 to form an edge connection or alternatively a pluggable connector to allow pluggability into an edge connector or a second pluggable connector respectively of a host printed circuit board." Tan ¶ 72.

[6] "Levinson et al teaches "these programs and instructions contained in memory 222 may be modified by the user(s) such that the optoelectronic device may be reprogrammed to communicate in various network protocols and to perform a variety of operations. By altering the program codes contained in memory 222, additional functionality may be added to the optoelectronic device without altering the interface through which it communicates with the host.'" Final Act. 9 (citing Levinson ¶ 54) (emphasis omitted).

Id.

Appellant's contention is unpersuasive in the absence of sufficient evidence or reasoning explaining why the modification would have been beyond the capabilities of one of ordinary skill in the art. In particular, Appellant fails to explain why Denton's disclosure is inadequate. Instead, Denton "is presumptively enabling barring any showing to the contrary." *In re Antor Media Corp.*, 689 F.3d 1282, 1288 (Fed. Cir. 2012). To rebut this presumption, Appellant "must generally do more than state an unsupported belief that a reference is not enabling." *In re Morsa*, 713 F.3d 104, 110 (Fed. Cir. 2013). "To be enabling, the specification of a patent must teach those skilled in the art how to make and use the full scope of the claimed invention without 'undue experimentation.'" *Genentech, Inc. v. Novo Nordisk, A/S*, 108 F.3d 1361, 1365 (Fed. Cir. 1997) (quoting *In re Wright*, 999 F.2d 1557, 1561 (Fed. Cir. 1993)). "[A] patent specification complies with the statute even if a 'reasonable' amount of routine experimentation is required in order to practice a claimed invention." *Enzo Biochem, Inc. v. Calgene, Inc.*, 188 F.3d 1362, 1371 (Fed. Cir. 1999). Appellant fails to identify any deficiencies in Denton that would present a unique challenge to one of ordinary skilled in the art in making the asserted modification to Levinson's device.

Furthermore,

> The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.

In re Keller, 642 F.2d 413, 425 (CCPA 1981) (citations omitted). The artisan is not compelled to mechanically follow the teaching of one prior art reference over the other without the exercise of independent judgment. *See Lear Siegler, Inc. v. Aeroquip Corp.*, 733 F.2d 881, 889 (Fed. Cir. 1984). Instead, the skilled artisan would "be able to fit the teachings of multiple patents together like pieces of a puzzle" because the skilled artisan is "a person of ordinary creativity, not an automaton." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 420–21 (2007). Here, Appellant has not demonstrated that the Examiner's proffered combination in support of the conclusion of obviousness would have been "uniquely challenging or difficult for one of ordinary skill in the art." *Leapfrog Enters., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1162 (Fed. Cir. 2007) (citing *KSR*, 550 U.S. at 420).

B. Reason to Combine References

Appellant argues the Examiner's reason for modifying Levinson to include Denton's Ethernet MAC "does not imply a motivation to pick out these references and combine them to arrive at Appellants claim." Appeal Br. 9 (contending, in combining references, it is inadequate that "a skilled artisan, once presented with these references would have understood that they could be combined" and, instead, there must be an articulated reason why the teachings would have been combined. (emphasis added)).

This argument is unpersuasive. The Federal Circuit has held "while an analysis of obviousness always depends on evidence that supports the required *Graham* factual findings, it also may include recourse to logic, judgment, and common sense available to the person of ordinary skill that do not necessarily require explication in any reference or expert opinion." *Perfect Web Techs., Inc. v. InfoUSA, Inc.*, 587 F.3d 1324, 1329 (Fed. Cir.

2009); *see also Nat'l Steel Car, Ltd. v. Canadian Pacific Ry., Ltd.*, 357 F.3d 1319, 1337 (Fed. Cir. 2004) ("It has long been the law that the motivation to combine need not be found in prior art references, but equally can be found 'in the knowledge generally available to one of ordinary skill in the art.'" (Quoting *In re Jones*, 958 F.2d 347, 351 (Fed. Cir. 1992))). The court further instructs that

> [w]hen there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense.

KSR, 550 U.S. at 421.

The Examiner finds

> it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the teachings of Masucci et al and Denton et al to the system/method of Levinson et al and Huang et al and Tan et al so that the transceiver module can be used for Ethernet PON [(passive optical network)] system.

Final Act. 9. In the absence of sufficient evidence or argument to the contrary, we find the Examiner has articulated reasoning with rational underpinnings sufficient to justify the legal conclusion of obviousness. Therefore, we are unpersuaded by Appellant's contention that the Examiner's combination of references is inadequate or improper.

Appellant further contends "[t]he Examiner seems to mistakenly conflate Ethernet or Ethernet MAC with Ethernet PON (taken to mean EPON [(Ethernet passive optical network)) or EPON MAC, however they are different protocols or devices. Merely having an Ethernet MAC does not produce an EPON system." Appeal Br. 9. The Examiner responds, finding

"Masucci et al and Denton teach/suggest that the protocol processor [as taught by the combination of Levinson and Tan] includes an Ethernet MAC." Ans. 34.

Appellant's argument is unpersuasive of reversible Examiner error. Levinson discloses protocol processing circuit of control circuit 150 exchanges data with a host device over serial interface connections shown in Figs. 2A and 7 (e.g., electrical interface 702 for coupling to a host device). Levinson further discloses control circuitry 150 includes protocol engine 350 "programmable to communicate in various network protocols" (Levinson ¶ 9) and that control circuitry 150 includes instruction and program memory 222 (Levinson ¶ 52). "[P]rograms and instructions contained in memory 222 may be modified by the user(s) such that the optoelectronic device may be reprogrammed to communicate in various network protocols." Levinson ¶ 54. Masucci discloses an Ethernet MAC installed in remote terminal 30 (Masucci Fig. 1) and Denton an Ethernet MAC 210 implemented in a protocol processor (Denton Figs. 1, 2). Final Act. 9. Thus, we agree with the Examiner in finding the combination of Levinson, Masucci, and Denton teaches or suggests the disputed limitations of claim 4 wherein Levinson's protocol processor includes an Ethernet MAC as taught by Masucci and disposed as taught by Denton so as to enable Ethernet communications between the protocol processor (Levinson's control circuitry 150) and the switch, router or media converter (i.e., Levinson's host device).

C. Reasonable Expectation of Success

Appellant contends "there is no reasonable expectation of success in a functional Ethernet MAC in the proposed modification to Levinson and thus

no reason to combine." Appeal Br. 10. Appellant argues that providing an Ethernet MAC in Levinson's device by altering program codes in memory 222 would not result in any added functionality because Levinson filters data based on IP address and Levinson suggests not otherwise altering communication with the host. *Id.* Thus, according to Appellant,

> any received data packet addressed to the proposed Ethernet MAC in memory 222 in Levinson AND NOT containing the IP address of Levinson's optical transceiver are passed through Levinson's optical transceiver module AND NOT processed by the proposed Ethernet MAC in memory 222; [while] [a]ny received data packet addressed to the proposed Ethernet MAC AND containing the IP address of Levinson's optical transceiver would already be processed without modification to Levinson's transceiver due to the IP address.

Id. at 10–11.

The Examiner responds, explaining how Levinson would be modified to include an Ethernet MAC. Ans. 36–37. The Examiner concludes Levinson does not teach away from the proposed modification. *Id.* at 37. The Examiner further points out, contrary to Appellant's argument, "Levinson et al never state that the interface cannot be altered. Levinson et al actually states 'obviously many modifications and variations are possible in view of the above teachings' ([0068])." *Id.* Thus, according to the Examiner "Levinson does not teach away from the proposed modification; and Levinson and Masucci and Denton are combinable; and the combination of Levinson and Masucci and Denton teaches/suggests the proper processing of the data packets and Ethernet address, 'with a reasonable expectation of success'." *Id.* at 38.

Appellant's contention is unpersuasive of reversible Examiner error. "Obviousness does not require absolute predictability of success." *In re*

O'Farrell, 853 F.2d 894, 903 (Fed. Cir. 1988). The optoelectronic devices of Levinson, Huang, Tan, Masucci, and Denton are in the predictable arts of optoelectronics governed by well-established scientific principles of electronics, optics, and physics in general. Appellant provides insufficient evidence those devices would behave other than in accordance with known electriconic circuits. Furthermore, we find insufficient evidence that adding Masucci and Denton's Ethernet to Levinson's optoelectronic device would conflict with known interfacing and protocol conversion techniques. Thus, we find one skilled in the art would have had a reasonable expectation of success. In sum, Appellant provides insufficient evidence, other than mere assertion, that one ordinarily skilled in the art would not reasonably expect be successful in modifying or combining the applied teachings and suggestions of the references. We note such conclusory statements that are unsupported by factual evidence as alleged by Appellant are entitled to little probative value. *In re Geisler*, 116 F.3d 1465, 1470 (Fed. Cir. 1997); *see also In re De Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984). *See also Estee Lauder, Inc. v. L'Oreal, S.A.*, 129 F.3d 588, 595 (Fed. Cir. 1997) (Argument made in a brief does not substitute for evidence lacking in the record).

We also disagree with Appellant's contention that Levinson teaches away from the proposed modification. *See* Appeal Br. 11. To teach away, the prior art must "criticize, discredit, or otherwise discourage the solution claimed." *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). Teaching an alternative method does not teach away from the use of a claimed method. *See In re Dunn*, 349 F.2d 433, 438 (CCPA 1965); *see also Ex parte Shuping*, No. 2008-0394, 2008 WL 336222, at *2 (BPAI 2008) (unpublished) ("'[T]eaching a way is not teaching away.'" (citation omitted)); *In re*

Geisler, 116 F.3d at 1471 (holding that merely "express[ing] a preference" falls short of discouraging one of ordinary skill in the art from following a particular path). Appellant fails to identify any such criticism, discrediting or discouragement.

Appellant's argument is further unpersuasive because it improperly relies on wholesale incorporation/combination of structures rather than what the combination of Levinson, Huang, Tan, Masucci, and Denton teaches and suggests. *See* discussion above addressing Appellant's contention that modifying Levinson to include Denton's MAC would not have been an obvious or trivial matter which we find unpersuasive for similar reasons as discussed.

For the reasons discussed above, we sustain the rejection of claim 4 under pre–AIA 35 U.S.C. § 103(a) over Levinson, Huang, Tan, Masucci, and Denton.

D) Claim 15

> 15. The method of claim 14, wherein the protocol processor is adapted to process and perform data link layer communications and the protocol processor is adapted to include an Ethernet media access controller (MAC), the method further comprising:
>
> receiving a first optical signal through an optical interface port at a bidirectional optical assembly of the optical transceiver module;
>
> converting the first optical signal to an electrical signal at the bidirectional optical assembly and conveying the electrical signal to the protocol processor of the optical transceiver module;
>
> processing the electrical signal at the protocol processor to determine a first optical data link layer frame and de-encapsulating a first user payload data from the first optical data link layer frame;

> conveying the first user payload data from the protocol processor to the Ethernet MAC;
> encapsulating the first user payload data in a first Ethernet data frame by the Ethernet MAC and conveying the first Ethernet data frame to the switch, router or media converter through the electrical network interface port;
> receiving a second Ethernet data frame from the switch, router or media converter through the electrical network interface port of the optical transceiver module;
> de-encapsulating a second user payload data from the second Ethernet data frame by the Ethernet MAC;
> conveying the second user payload data from the Ethernet MAC to the protocol processor;
> encapsulating the second user payload data into a second optical data link layer frame by the protocol processor;
> converting the second optical data link layer frame to a second optical signal; and
> transmitting the second optical signal from the bidirectional optical assembly through the optical interface port.

The Examiner finds the limitations of claim 15 are taught or suggested by the combination of Levinson, Tan, Masucci, Denton, and Scarmalis. Final Act. 19–23.

> Regarding the encapsulating/de-encapsulating the payload data in the Ethernet MAC, it is a common operation in the MAC, Masucci et al discloses the data link layer encapsulation (Figures 3-8, and column 6 line 1 to column 7 line 13). And Denton also teaches "PPP/HDLC processor 216 is employed to frame or de-frame IP and POS data, providing appropriate encapsulation or de-encapsulation, in accordance to PPP and HDLC. Similarly, HDLC POS coder 218 is provided to perform physical sub-layer Packet on SON ET coding and decoding for the egress and ingress HDLC data respectively". Another prior art, Scarmalis discloses that in the OSI-layer 2, which is under the OSI-layer 3, the encapsulation/de-encapsulation is performed (Background of Invention and Figures 1-7).

Id. at 22. According to the Examiner, it would have been obvious to

combine the references "so that the transceiver module [of Levinson] can be used for Ethernet PON system[s], and the Ethernet MAC in the transceiver module can perform the encapsulating/de-encapsulating the user payload data and convey the user payload data to/from the protocol processor." *Id.* at 22–23.

Appellant contends

> It is not clear how program memory 222 would operate to perform the encapsulation/de-encapsulation functions separate from processor 224 or from itself if the protocol processor is deemed to include both processor 224 and memory 222. Appellants[] respectfully submit a proper clearly articulated motivation to combine references has not been made and for at least this reason alone this rejection should be withdrawn.
>
> Furthermore, the reference to [Scarmalis] teaches away from the proposed modification as [Scarmalis] suggests OSI Layer 2 is under OSI Layer 3 yet the proposed modification proposes the exact opposite by putting OSI Layer 3 processing under OSI Layer 2. For example, the proposed Ethernet MAC (OSI Layer 2), would only see data processed at OSI Layer 3 (i.e, data filtered by IP address) which is the exact opposite of the OSI model and why there is no reasonable expectation of success or usefulness in doing so as previously argued by Appellants[] in claim 4.

Appeal Br. 12.

The Examiner responds, explaining "Levinson et al never states that the program memory (222) itself performs the encapsulation/de-encapsulation functions. The program in the memory is used by the processor so to perform the encapsulation/de-encapsulation functions." Ans. 39. Appellant replies "[e]ven with this clarification by the Examiner it is unclear what the motivation to combine references to reject claim 15." Reply Br. 5.

Appellant's contention is unpersuasive of reversible Examiner error. The Examiner finds:

> [I]t would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the teachings of Masucci et al and Denton et al and Scarmalis to the system/ method of Levinson et al and Tan et al so that the transceiver module can be used for Ethernet PON system, and the Ethernet MAC in the transceiver module can perform the encapsulating/ de-encapsulating the user payload data and convey the user payload data to/from the protocol processor.

Final Act. 22–23. Although alleging in reply "[a]t best the motivation seems to mean so that the protocol processor 224 can convey data to/from itself" (Reply Br. 5), Appellant fails to provide sufficient evidence or reasoning explaining why the asserted modification would be ineffective for providing the functionalities identified by the Examiner or otherwise detract from the Examiner's rationale for making the combination. Furthermore, absent a showing of good cause explaining why the argument could not have been presented in the Appeal Brief, this newly presented argument is untimely and waived. 37 C.F.R. § 41.41(b)(2) (2016). Accordingly, we sustain the rejection of claim 15 under 35 U.S.C. § 103(a).

E) Claims 6 and 8

> 6. The pluggable optical transceiver module of claim 1, wherein the protocol processor performs functions conforming to a network protocol selected from the group consisting essentially of:
>
> ITU-T G.984 Gigabit PON (GPON);
> IEEE 802.3ah Ethernet PON (EPON);
> ITU-T G.987 10 Gigabit PON (XG-PON);
> IEEE 802.3av 10 Gigabit Ethernet PON (1OG-EPON);
> ITU Next Generation PON (NG-PON);

> ITU NG-PON2;
> WDM-PON;
> ITU-T G.983 Broadband Passive Optical Network (BPON);
> Data over Cable Service Interface Specification (DOCSIS) PON (D-PON/DPON); and
> RFoG SCTE IPS910.

> 8. The pluggable optical transceiver module of claim 1, wherein the pluggable optical transceiver module is an Optical Network Unit (ONU) or Optical Network Terminal (ONT).

The Examiner finds, although "Levinson . . . does not expressly state . . . the protocol processor performs functions conforming to a network protocol [recited by claim 6,] . . . GPON, EPON, and RFoG are well-known system[s] in the art" as evidenced by the EPON systems taught by Song and Xu." Final Act. 10–11 (citing Song, Fig. 7 (optical modules 704, 754); and Xu col. 8, ll. 57–60). Similarly, in connection with claim 8, the Examiner finds Song and Xu teach ONUs and ONTs. *Id.* at 12.

Appellant contends the rejection of claim 6 is improper because "[t]he references to Song and Xu disclose use of traditional [electrical-to-optical] and [optical-to-electrical] transceiver modules and do NOT support the Examiner's conclusory statement that Levinson's optical transceiver module, in combination or not, can be used in PON systems." Appeal Br. 13. Appellant argues the Examiner fails to explain "specifically how Levinson's protocol processor performs one of the optical network protocols as claimed [in] Appellant['s] claim 6." *Id.*

The Examiner responds, noting that claim 6 only recites the argued protocol, not *how* to perform the protocols. Ans. 43. Furthermore, according to the Examiner, Levinson teaches extracting traffic based on an Ethernet address while Song and Xu teach a transceiver module installed in

optical line terminals (OLTs) and optical network units (ONUs). *Id.* Thus, the Examiner concludes "[it would have been obvious] to one skilled in the art that the pluggable optical transceiver of Levinson in combination [with] Huang . . . Tan . . . Song . . . and Xu . . . can be used in the GPON, EPON, RFoG and WDM-PON etc." *Id.* Appellant responds, arguing "the Examiner's rejection does not suggest in view of Song and Xu a modification to Levinson's protocol processor to support . . . functions conforming to a network protocol selected from the group listed in claim 6." Reply Br. 5 (quoted statements reordered).

Appellant's contentions in connection with claim 6 are unpersuasive of reversible Examiner error. As indicated by the Examiner, claim 6 does not recite how the recited protocols are to be implemented by the protocol processor of claim 1. Thus, Appellant's argument is not commensurate in scope with claim 6.

Furthermore, "[w]hile a reference must enable someone to practice the invention in order to anticipate under § 102(b), a non-enabling reference may qualify as prior art for the purpose of determining obviousness under § 103." *Symbol Techs., Inc. v. Opticon, Inc.*, 935 F.2d 1569, 1578 (Fed. Cir. 1991). In particular, "a reference . . . is prior art for all that it teaches." *Beckman Instruments, Inc. v. LKB Produkter AB*, 892 F.2d 1547, 1551 (Fed. Cir. 1989). The prior art must enable an ordinarily skilled artisan to make and use the claimed subject matter to render the claimed subject matter obvious. *See In re Kumar*, 418 F.3d 1361, 1368–69 (Fed. Cir. 2005); *Beckman Instruments*, 892 F.2d at 1551. But that does not mean that any one reference must enable the claimed subject matter within the reference's four corners. It is sufficient that the combined teachings of the references

render the claimed subject matter obvious when the teachings are considered together with the knowledge of an ordinarily skilled artisan. *See In re Paulsen*, 30 F.3d 1475, 1480–81 (Fed. Cir. 1994). Cited references do not have to explain every detail to render a claimed invention obvious because the references speak to those skilled in the art. *See id.* at 1480. "A patent need not teach, and preferably omits, what is well known in the art." *Spectra-Physics, Inc. v. Coherent, Inc.*, 827 F.2d 1524, 1534 (Fed. Cir. 1987) (citation omitted).

Appellant offers insufficient evidence in support of the assertion that Levinson's optical transceiver module could not be used in PON systems. *See* Appeal Br. 13. "[S]tatements of counsel in a brief cannot take the place of evidence." *In re Walters*, 168 F.2d 79, 80 (CCPA 1948) (citations omitted). In the absence of sufficient evidence that modifying Levinson to implement one of the recited protocols would have been proved uniquely challenging, unusually difficult, require undue experimentation or produce unpredictable results, we disagree a detailed explanation of how to implement the protocols is required to support the rejection. *Leapfrog*, 485 F.3d at 1162.

Appellant further argues the Examiner's rationale for combining Levinson and Xu is improper because "Levinson processes data based on IP address (i.e., OSI Layer 3 or [the] Network Layer address) and not by MAC address (i.e., OSI Layer 2 or Data Link Layer address)". Appeal Br. 14. We find this argument unpersuasive because the Examiner relies on Xu only for teaching an EPON network in which transceiver modules are installed in an OLT and ONU (Final Act. 12), not for the particular implementation disclosed by the Xu. Furthermore, in the absence of sufficient evidence that

Xu criticizes, discredits, or otherwise discourages the solution claimed, we are unpersuaded the reference teaches away from making the asserted combination as argued by Appellant (Appeal Br. 13). *See In re Fulton*, 391 F.3d at 1201. Moreover, "[a] person of ordinary skill is also a person of ordinary creativity, not an automaton." *KSR*, 550 U.S. at 421. An obviousness determination is not limited to instances where the person of ordinary skill already knows how to combine the specific references or has a document that plainly describes how to do so. The references can be considered together with the knowledge of ordinarily skilled artisans. *In re Paulsen*, 30 F.3d at 1480–81.

In connection with claim 8, Appellant argues Song's optical module 754[7] is not part of an ONU but is separate. Appeal Br. 13. Appellant argues "Song's optical module 745 [*recte* 754] in Figure 7B is clearly differentiated from the ONU external to optical module 745 as indicated by the dotted line and teaches away from Appellant['s] claim 8." *Id.*

The Examiner responds, citing to definitions of an ONU and ONT appearing in Appellant's Specification in support of a finding that "according to [Appellant], the ONU/ONT has an optical transceiver module and other processing circuit." Ans. 44. Relying on this interpretation, the Examiner further finds Song and Xu "teach[] the same ONU (Song: Figure 7; Xu: Figure 4) comprising optical transceiver module and other processing circuits. That is, the pluggable optical transceiver module [of Song and Xu] forms an Optical Network Unit (ONU) or Optical Network Terminal (ONT) [as claimed]." *Id.*

[7] Although referencing the argued component as "optical module 7*45*" (Appeal Br. 13), it appears Appellant is referring to optical module 754.

Appellant's contention is unpersuasive of reversible Examiner error. Song's optical modules are depicted within a larger box labeled as an ONU as shown in Fig. 7B. We find insufficient evidence supporting Appellant's assertion that the dotted line surrounding Song's optical module indicates the module is not part of the ONU. Furthermore, was agree with the Examiner in finding that Appellant's definition of an ONU and ONT supports a finding that Song and Xu teach or suggest the disputed limitation of claim 8 wherein the pluggable optical transceiver module of claim 1 is an ONU or ONT.

Finally, we are unpersuaded by Appellant's argument the Examiner has failed to provide sufficient motivation to combine the references. Appeal Br. 14. As discussed above, there is no requirement that the references provide motivation for making the combination, only that the Examiner provide articulated reasoning with rational underpinnings sufficient to justify the legal conclusion of obviousness. *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (*cited with approval*, 550 U.S. at 418). Herein the Examiner finds the reason to combine the references was "to use the pluggable transceiver module in the OLT and ONU to realize the EPON communications." Final Act. 11. According to Appellant, because "Levinson's optical transceiver module can already be used in EPON systems . . . there is no motivation to combine references in the first place to realize EPON communications." Appeal Br. 14. However, the Examiner's reasoning is not just to provide EPON communications, but to use a pluggable transceiver module *in an OLT or ONU* to allow the OLT or ONU, as recited by claim 8, to realize EPON communications. Appellant's argument fails to address the entirety of the Examiner's reason for

combining the references and is, therefore, unpersuasive.

For the reasons discussed above, we sustain the rejection of claims 6 and 8 under pre–AIA 35 U.S.C. § 103(a) over Levinson, Huang, Tan, Song, and Xu. Because Appellant argues the rejection of claims 17 and 19 on the same bases (Appeal Br. 15), we similarly sustain the rejection of those claims under pre–AIA 35 U.S.C. § 103(a) over Levinson, Tan, Song, and Xu.

F) Claim 7

> 7. The pluggable optical transceiver module of claim 1, wherein the pluggable optical transceiver module is an Optical Line Terminal (OLT) and configuration of the OLT for provisioning service level agreements (SLAs) is performed in-band using OSI Layer 3 communications.

The Examiner finds Levinson's optical transceiver has an IP network address (i.e., OSI layer 3) and participates in in-band traffic for performing functions otherwise performed by host equipment. Final Act. 13. The Examiner further finds Levinson teaches status information generated by a status monitoring module is incorporated into in-band data by a protocol engine for communicating the status information to a host or remote device. *Id.* (citing Levinson, Abstract). The Examiner also relies on Wang's disclosure of PON data transfers according to service level agreements with prioritization information passed to an OLT to enforce policies and bandwidth allocation for teaching the recited OLT provisioning service level agreements. *Id.* Thus, the Examiner relies on Levinson, Huang, and Tan in combination with Wang for teaching or suggesting the disputed limitations of claim 7. *Id.*

Appellant contends Wang uses OSI Layer 1, not Layer 3, to allocate ONU bandwidth using SONET/SDH (synchronous optical networking/ synchronous digital hierarchy). Appeal Br. 15. Addressing Levinson, Appellant argues the Examiner does not explain how Levinson's optical transceiver unit can enforce policies and allocate bandwidth to an OLT. *Id.* at 16. Appellant further argues Levinson's optical transceiver is distinct from the OLT such that the Examiner's motivation for combining the references "'so to use the pluggable transceiver in the OLT'" (*Id.* (quoting Final Act. 14)) is based on an error in fact and, therefore, is deficient. *Id.* Appellant still further argues, because Levinson's optical transceiver operates using internet protocol at OSI Layer 3 while Wang ONU uses SONET/SDH communication protocol at OSI Layer 1, "Levinson's optical transceiver will not receive Wang's ONUs request for bandwidth as the ONUs do not use [an] IP address for the request." *Id.*

The Examiner responds, disputing Appellant's contention that Levinson's optical transceiver is not an OLT. Ans. 47. Instead, according to the Examiner's definition of an OLT[8] and consistent with Appellant's Specification, the Examiner finds that "the optical module disclosed by Levinson[,] . . . Huang[], . . . Tan[,] . . . and Wang . . ., in which an optical

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[8] According to [a] conventional definition, [an] OLT is a device which serves as the service provider endpoint of a passive optical network; it provides two main functions: to perform conversion between the electrical signals used by the service provider's equipment and the fiber optic signals used by the passive optical network, and to coordinate the multiplexing between the conversion devices on the other end of that network (ONTs or ONUs).

Ans. 47.

transceiver is implemented, is an OLT." *Id.* The Examiner further finds the combination of Wang's prioritization information passed to an OLT and Levinson's insertion of packets of information generated by a device into in-band data (i.e., OSI Layer 3) teaches or suggests the disputed limitations of claim 7. *Id.* at 48.

Appellant replies, arguing the Examiner mischaracterizes Wang as using OSI layer 3.

Appellant's argument that the rejection is improper because of Wang's use of OSI Layer 1 to communicate SLA data fails to address the Examiner's finding that Levinson uses OSI Layer 3 for communicating status information. *See* Final Act. 13. Thus, Appellant's argument is an improper attack on the references individually where the rejection is based on the combination of references. *See Keller*, 642 F.2d at 426; *In re Merck & Co., Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986). Therefore, Appellant's argument is unpersuasive of reversible Examiner error.

We also find unpersuasive Appellant's argument the rejection is deficient because the Examiner does not explain how Levinson's optical transceiver unit can enforce policies and allocate bandwidth to an OLT. By setting forth a prima facie case of obviousness, the burden shifts to Appellant to allege deficiencies and errors rebutting a rejection. *See, e.g., In re Dillon*, 919 F.2d 688, 692 (Fed. Cir. 1990). Herein, Appellant only alleges the Examiner has not provided a detailed explanation of how the combined teachings of the references would be practically implemented rather than alleging error in the substance of the rejection such as providing evidence that the teachings are not combinable to teach or suggest the disputed limitations.

Furthermore, because we disagree with Appellant's premise that Levinson's optical transceiver is not an OLT (Appeal Br. 16), there is insufficient support for Appellant's conclusion that motivation is lacking for combining the references. We also find unpersuasive Appellant's argument that Levinson's optical transceiver, operating at OSI Layer 3, would not receive Wang's ONU request at Layer 1. Such argument is unpersuasive because it relies on wholesale incorporation/combination of structures rather than what the combination of Levinson and Wang fairly teaches or suggests. *See Keller*, 642 F.2d at 425. The artisan is not compelled to blindly follow the teaching of one prior art reference over the other without the exercise of independent judgment. *See Lear Siegler*, 733 F.2d at 889; *KSR*, 550 U.S. at 420–21. Here, Appellant has not demonstrated that the Examiner's proffered combination in support of the conclusion of obviousness would have been "uniquely challenging or difficult for one of ordinary skill in the art." *Leapfrog*, 485 F.3d at 1162 (citing *KSR*, 550 U.S. at 420).

For the reasons discussed above, we sustain the rejection of claim 7 under pre–AIA 35 U.S.C. § 103(a) over Levinson, Huang, Tan, and Wang.

G) Claim 9

> 9. The pluggable optical transceiver module of claim 1, wherein the protocol processor is adapted to perform one or more of the following functions:
> deep packet inspection;
> network address translation;
> data encryption or decryption securitization; and
> encryption or decryption key management.

The Examiner finds Levinson discloses modifying memory 222 to provide additional functionality that, in combination with Johnston's

disclosure of providing functionality for communicating encrypted data and keys between OLT and ONU, teaches or suggests the limitations of claim 9. Final Act. 14–15 (citing Johnston col. 7, l. 10 – col. 8, l. 15). The Examiner's reason for combining the references is to enhance "the functions of the packet inspection, address translation, data encryption or decryption, and key management etc." *Id.* at 15.

Appellant contends the combination of Levinson and Johnston is improper because, according to Appellant, Levinson teaches away from modifying memory 222 to implement data encryption functionality. Appeal Br. 18. Appellant argues decrypting data packets would require altering the host interface "which Levinson expressly states may not be altered." *Id.* Appellant further argues, if made, the proposed modification would alter Levinson's principle of operation. *Id.* Appellant furthermore argues "there is no reasonable expectation of success in the suggested combination as Johnston discusses encryption/decryption at OSI Layer 2 or the data link layer using GPON . . . [while] Levinson filters data packets by IP address or at OSI Layer 3." *Id.* (citations omitted).

The Examiner responds, disputing Appellant's contention that Levinson discourages altering the host interface, instead finding Levinson teaches instructions and program memory can be changed to modify the operational state of the transceiver and to reprogram the optoelectronic device to communicate in various network protocols and perform a variety of operations. Ans. 50–51. The Examiner finds "Levinson . . . never state[s] that the interface cannot be altered. Levinson . . . actually states 'obviously many modifications and variations are possible in view of the above teachings.'" *Id.* (quoting Levinson ¶ 68). The Examiner also disputes

Appellant's argument that Johnston's use of OSI Layer 2 is incompatible with Levinson, finding instead that Johnston teaches the use of layer 3 and other layers.[9] *Id.* (citing Johnston col. 15, ll. 44–48.)

Appellant replies, contending Johnston's reference to layer 3 is actually to system packet interface layer 3, which is an OSI layer 2 interface. Reply Br. 6. Appellant also questions whether Johnston's reference to "other layers" means OSI Layers other than OSI Layer 2, (e.g., OSI Layer 3 as used by Levinson). *Id.*

Appellant's contentions are unpersuasive of reversible Examiner error. We find Levinson's disclosure of adding functionality without altering the interface suggests a capability (i.e., a benefit) of not requiring modification of the interface rather than indicating there is a reason to avoid or restrict any such modification. Thus, Levinson does not discourage making modifications to support encryption and does not teach away from the combination with Johnston. Appellant's remaining contentions are naked allegations of error without sufficient supporting evidence or reasoning to be persuasive. For example, Appellant does not explain why the principle of operation of Levinson would be changed by supporting encryption or decryption key management (Appeal Br. 18) or why there would be no reasonable expectation of success. At most, Appellant's arguments are improperly based on a wholesale incorporation/combination of structures rather than what the combination of Levinson, Huang, Tan, and

[9] "As further examples, the architecture may further include an Ethernet switch interface circuit coupled to an Ethernet switch for monitoring and redundancy, a system packet interface layer 3 (SPI-3) circuit, a synchronous optical network, etc. Other layers may also be supported by the architecture." Johnston col. 15, ll. 44–48.

Johnston reasonably teaches and/or suggests. *See Keller*, 642 F.2d at 425.

For the reasons discussed above, we sustain the rejection of claim 9 under pre–AIA 35 U.S.C. § 103(a) over Levinson, Huang, Tan, and Johnston.

H) Claims 11 and 21

> 11. The pluggable optical transceiver module of claim 1, wherein the pluggable optical transceiver module further comprises a modulation assembly electrically coupled between the protocol processor and the bidirectional optical assembly, the modulation assembly communicating with the protocol processor using binary communications and the modulation assembly communicating with the bidirectional optical assembly using m-ary communications wherein the m-ary communication is selected from the group consisting essentially of:
>
> Quadrature Amplitude Modulation (QAM);
> QAM-32, QAM-256;
> Pulse Amplitude Modulation (PAM);
> PAM-4;
> PAM-5;
> PAM-16;
> PAM-17;
> Quadrature Phase Shift Keying (QPSK);
> Differential QPSK (DQPSK);
> return-to-zero QPSK (RZ-QPSK);
> dual-polarized QPSK (DP-QPSK); and
> Orthogonal Frequency Division Multiplexing (OFDM).
>
> (Claim 21, which depends from claim 14, recites corresponding limitations.)

The Examiner finds "binary communications using m-ary communications of QAM, PAM, QPSK, OFDM etc. are well-known and commonly used modulation formats in the art," with Ethridge disclosing the use of QAM in optical communications. Final Act. 16 (citing Ethridge

¶ 52). The Examiner reasons

> it would have been obvious to one of ordinary skill in the art at the time the invention was made to use one of the commonly used [binary] modulation format from QAM, PAM, QPSK, OFDM etc. [as taught by Ethridge] in the system/method of Levinson, . . . Huang, . . . and Tan . . . so to transfer the data over the optical network.

Id.

Appellant contends the rejection is improper because (i) the Examiner "confuse[s] binary communications with data that is digital or represented as binary bit(s)." Appeal Br. 19. Appellant argues "[b]inary communications and [the claimed] m-ary communications such as QAM are not the same thing by definition." *Id.* Appellant further questions (ii) "how Levinson's laser driver . . . is to perform digital m-ary modulation conversion while still performing expected function of driving the laser." *Id.* Appellant also argues (iii) the Examiner's reason for combining references by modifying Levinson use Ethridge's QAM so as to transfer data over an optical network is improper because "Levinson already accomplishes transferring data over the optical network and therefore [there would have been] no motivation to combine references." *Id.* at 20.

The Examiner responds explaining (i) the argued misstatement confusing binary and m-ary communications was a typographical error, the Examiner intending to reference the language of claim 11 requiring the modulation assembly having the capability to (a) communicate with the protocol processor using binary communications and (b) communicate with the bidirectional optical assembly using m-ary communications. Ans. 54. The Examiner acknowledges binary and m-ary communications are different. *Id.* The Examiner further explains (ii) how Levinson's laser

would operate in an m-ary mode. *Id.* at 54–55. Furthermore, the Examiner disagrees Ethridge is limited to a copper wire network (Appeal Br. 19–20), finding the reference discloses communications using QAM over an optical network. Ans. 55. The Examiner concludes "it would have been obvious to one of ordinary skill in the art at the time the invention was made to use one of the commonly used modulation format from QAM, PAM, QPSK, OFDM etc. to transfer the data over the optical network." *Id.*

Appellant replies, arguing the Examiner fails to demonstrate that Levinson's device could be modified to use Ethridge's QAM system: "there is a gap in the references to support the Examiner's position and it is the burden of the Examiner to clearly substantiate the rejection to establish a prima facie case of obviousness." Reply Br. 7. Appellant further argues Etheridge teaches away from using QAM optically. *Id.*

Appellant's contentions are unpersuasive of reversible Examiner error. Concerning (i) differences between binary and m-ary communications, the Examiner acknowledges the distinction. We find any error to be harmless. We are also unpersuaded the Examiner has failed to (ii) provide a sufficient explanation of how Levinson's device and, in particular, laser driver 105 would operate to support QAM. *See* Ans. 54–55. Appellant provides insufficient evidence or reasoned argument to persuade us that one skilled in the art at the time of the invention would have been unsuccessful in modifying Levinson to incorporate Ethridge's QAM or otherwise would have found the modification to be uniquely challenging or difficult.

We are also unpersuaded by Appellant's contention that (iii) the Examiner's reasoning for modifying Levinson to include QAM so as to

provide for the transfer of data is inadequate because Levinson already includes such a capability without modification. The fact that a primary reference may already possess structure sufficient for accomplishing a particular task does not, without more, demonstrate the absence of motivation for seeking other ways to accomplish that task. "[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." *KSR*, 550 U.S. at 416 (citation omitted). "[A] person of ordinary skill has good reason to pursue the known options within his or her technical grasp." *Id.* at 421. We further note selection based on suitability for an intended purpose supports a prima facie case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 335 (1945) ("Reading a list and selecting a known compound to meet known requirements is no more ingenious than selecting the last piece to put into the last opening in a jig-saw puzzle."); *In re Fout*, 675 F.2d 297, 301 (CCPA 1982) ("Express suggestion to substitute one equivalent for another need not be present to render such substitution obvious."). Absolute predictability that the substitution will be successful is not required, all that is required is a reasonable expectation of success. *See In re O'Farrell*, 853 F.2d 894, 903–04 (Fed. Cir. 1988).

For the reasons discussed above, we sustain the rejection of claim 11 under pre–AIA 35 U.S.C. § 103(a) over Levinson, Huang, Tan, and Ethridge. Furthermore, because Appellant relies on argument presented in connection with claim 11 in arguing for the patentability of claim 21 (Appeal Br. 20–21), we likewise sustain the rejection of claim 21 under pre–AIA 35 U.S.C. § 103(a) over Levinson, Tan, and Ethridge.

I–K) Claims 12 and 22

> 12. The pluggable optical transceiver module of claim 11, wherein the modulation assembly further includes one or more of the following functions:
>
> blind equalization;
>
> shaping, conditioning or emphasizing data for improved transmission performance;
>
> trellis encoding or decoding;
>
> encoding or decoding data to compensate for the relative noise intensity (RIN) of the bidirectional optical assembly to improve performance; and
>
> forward error correction.
>
> (Claim 22, which depends from claim 21, recites corresponding limitations.)

The Examiner finds, although not expressly disclosing a modulation assembly performing the recited functions of claim 12, Levinson discloses the capability to accommodate additional functionalities by altering program code stored in memory. Final Act. 17 (quoting Levinson ¶ 54). The Examiner also finds "Cox . . . discloses that forward error correction [(FEC)] can be implemented in a transceiver." *Id.* (citing Cox Figure 3). According to the Examiner, it would have been obvious "to apply the FEC as taught by Cox . . . to the system/method of Levinson . . . Huang . . . Tan . . . and Ethridge . . . so to correct errors, and improve system reliability." *Id.*

Appellant contends (I) the Examiner "conflate[s] memory 222 to Appellant['s] protocol . . . assembly. Given the Examiner's position the suggested modification does not read into Appellant['s] claim as the Examiner[] is not suggesting further m[o]di[fi]cation of Levinson's laser driver 105 to perform the additional features of Appellant['s] claim." Appeal Br. 21. Appellant further contends (J) the proposed modification has

no reasonable expectation of success because "any data packet containing a correctable FEC error but NOT containing the IP address of Levinson's optical transceiver module will pass through the module without memory 222 performing a correction." *Id.* at 21–22. Appellant still further contends (K) the Cox reference is deficient because it implements FEC in a transceiver, not inside an optical transceiver module. *Id.* at 22.

The Examiner responds as to contention (I):

> Levinson et al shows SERDES [(SERializing and DESerializing)] and driver [circuits] are between the control circuitry and the light source (laser), the control circuitry contains the protocol processing units and other signal processing circuits. Ethridge et al also discloses that a transmit framer is between the driver and the control circuitry. That is, the combination of Levinson and Ethridge et al teaches a modulation assembly that contains the processing circuit for determining the modulation format and driver etc.
>
> As discussed above, Levinson's control circuitry contains different processing units, which use the programs/instructions to perform different functionalities. The protocol processor in the control circuitry is not a part of "modulation assembly", but the processing circuit for determining the modulation format and driver etc. is. Therefore, Levinson et al and Huang et al and Tan et al and Ethridge et al "suggested all the limitations of the claimed invention".

Ans. 56–57.

Appellant replies, arguing there is no evidence that Levinson discloses other signal processing circuits for determining modulation format and driver as asserted by the Examiner. Reply Br. 8. In particular, Appellant argues Levinson fails to include circuitry that uses programs/instructions stored in memory 222 of processor 224 of protocol processor 350 that is part of the modulation assembly. *Id.*

Appellant's contention is unpersuasive because it is based on mechanically following the teachings of one prior art reference over the other without the exercise of independent judgment. *See Lear Siegler*, 733 F.2d at 889. As discussed above, the skilled artisan is not an automaton. *KSR*, 550 U.S. at 420–21. In spite of any inconsistencies alleged in the Examiner's proffered implementation, Appellant fails to persuade us that including forward error correction as taught by Ethridge in Levinson's modulation assembly would have been "uniquely challenging or difficult for one of ordinary skill in the art," whether by including the capability using memory or otherwise. *Leapfrog*, 485 F.3d at 1162 (citing *KSR*, 550 U.S. at 420).

The Examiner responds to Appellant's contention (J) that the modification has no reasonable expectation of success, finding:

1. Levinson does not state that a packet would *not* have an IP address;
2. Because FEC is performed before the driver, it is not clear why, as alleged by Appellant, a data packet having an IP address error will pass through without being corrected by memory 222; and
3. "[A]s shown in Figure 3 of Cox, the FEC (314) is between the Ethernet MAC (312) and the Mux/driver etc. (318 and 434/438 Figures 3 and 4), any signals that are sent from the MAC 312 to the Mux/driver (318/434/438) are processed by the FEC."

Ans. 57–58.

Appellant replies:

1. The Examiner's statement about Levinson is misleading, inferring Appellant's argument is based on the total absence of an IP address rather than how a data packet having an IP address other than that

of Levinson's optical transceiver module would be handled, i.e., passed through unmodified.

2. The Examiner's description of performing FEC before the driver indicates the Examiner is considering FEC before transmission when it is assumed error detection and correction is performed *after* a data packet is received.
3. "The Examiner's third position is challenging to understand given the cited hardware FEC of Cox Fig. 3 and the limitations of the suggested modification of program/instruction of Levinson's memory 222 and processor 224 to enabling FEC."

Reply Br. 8. Appellant argues "[the] positions taken by the Examiner fail to address the Appellants position that there is a reasonable expectation of failure in the suggested modification and therefore no reason to combine [the references]." *Id.*

Appellant's contentions are unpersuasive for the reasons discussed previously above in connection with Appellant's other contentions that there would have been no reasonable expectation of success in combining the teachings of the prior art references. "It is well-established that a determination of obviousness based on teachings from multiple references does not require an actual, physical substitution of elements." *In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012) (citing *In re Etter*, 756 F.2d 852, 859 (Fed. Cir. 1985) (en banc) (noting that the criterion for obviousness is not whether the references can be combined physically, but whether the claimed invention is rendered obvious by the teachings of the prior art as a whole)). *See also Keller*, 642 F.2d at 425 ("The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the

structure of the primary reference . . . . Rather, the test is what the combined teachings of [those] references would have suggested to those of ordinary skill in the art."); *In re Nievelt*, 482 F.2d 965, 968 (CCPA 1973) ("Combining the teachings of references does not involve an ability to combine their specific structures."). Thus, Appellant does not present sufficient persuasive arguments or evidence explaining why one of ordinary skill in the art would not have been motivated to combine the references, or why there would not have been a reasonable expectation of success of such combination.

For the reasons discussed above, we sustain the rejection of claim 12 under pre–AIA 35 U.S.C. § 103(a) over Levinson, Hung, Tan, Ethridge, and Cox. For the same reasons, we sustain the rejection of claim 22 under pre–AIA 35 U.S.C. § 103(a) over Levinson, Tan, Ethridge, and Cox, Appellant arguing claim 22 on the basis of argument presented in connection with claim 12. Appeal Br. 22–23.

L–O) Claims 1–3, 5, 10, and 13

> 1. A pluggable optical transceiver module configured to removably couple to an optical module port of a switch, router or media adapter, the pluggable optical transceiver module comprising:
>
> a protocol processor for managing the transmission and reception of Open Systems Interconnect (OSI) Layer 3 communications;
>
> an optical fiber interface port disposed to removably couple one or more optical fibers to the pluggable optical transceiver module;
>
> an electrical network interface port electrically coupled to the protocol processor and disposed for electrically coupling the pluggable optical transceiver module-to a switch, router or media converter;

> a bidirectional optical assembly optically coupled to the optical fiber interface port, the bidirectional optical assembly being electrically coupled to the protocol processor and disposed for transmitting optical signals through the optical fiber interface port responsive to electrical signals received from the protocol processor and further disposed to convey an electrical communication signal to the protocol processor responsive to receiving an optical communication signal through the optical fiber interface port, whereby
>
> the pluggable optical transceiver module is disposed to communicate using OSI Layer 3.

The Examiner finds Levinson teaches the limitations of claim 1 except "Levinson [does] not expressly show that a fiber is coupled to the optical fiber interface port, and the TOSA/ROSA [(transmitter optical subassembly/ receiver optical subassembly)] forms a bidirectional optical assembly coupled to the optical fiber interface port." Final Act. 6. To remedy the noted deficiencies, the Examiner finds Huang's disclosure of a plug-in module coupled to a transceiver to form a bidirectional optical assembly teaches or suggests making the transceiver module bidirectional as claimed. *Id.* The Examiner further finds Tan discloses a system that is "a pluggable optical transceiver module having a bidirectional optical assembly and removably couple[d] to an optical module port of a switch, router or media adapter." *Id.* According to the Examiner "it would have been obvious . . . to apply the bidirectional scheme as taught by Huang . . . and Tan . . . and widely used in the art to the system/method of Levinson . . . so that a single fiber can be used for signal transmission, and system cost can be reduced." *Id.*

L. Frustration of Purpose

Appellant contends Levinson uses remote management to adjust the

wavelength of an optical transceiver having a single transmitter using a single tunable wavelength "to be used with a plurality of other like transceivers whose accumulative transmissions are then combined onto an optical fiber to form a [Dense Wave Division Multiplexing (DWDM)] system." Appeal Br. 23. Appellant argues "[t]he suggested modification of combining Levinson's transmit and receive wavelengths onto a single fiber before the combination of communication from other like optical transceivers to and from a DWDM system adds unnecessary costs and degrades performance to this DWDM system as additional coupling is needed." *Id.* at 24.

The Examiner responds that Appellant's argument based on a DWDM system is not commensurate in scope with the claims. Ans. 62.

> "The suggested modification of combining Levinson's transmit and receive wavelengths onto a single fiber" does not mean[] that the combination Levinson . . . Huang . . . and Tan . . . must be used in [a] DWDM system[;] the statement "the combination of communication from other like optical transceivers to and from a DWDM system" is just the Appellant's presumption.

Id. The Examiner further disagrees the modification would not be desirable because it would result in a more expensive system, finding the resultant system would provide increased bandwidth and system capacity. *Id.* at 63. The Examiner finds Huang's disclosure that "[i]t is often desirable to limit the number of fiber optic cables between two communication points to save on material costs and installation" undermines Appellant's argument the combination adds unnecessary costs. *Id.* at 65.

Appellant replies, disputing the Examiner's alleged cost savings. Reply Br. 10. Appellant argues, in modifying Levinson's device to include a bidirectional optical assembly, the Examiner fails to consider the tunable

nature of Levinson's optical transceiver modules, which are more expensive than fixed optical transceivers used to implement a DWDM system. *Id.* at 11. According to Appellant "the Examiner['s] suggested modification of adding Huang and Tan to Levinson . . . would frustrate the intended use case of using tunable lasers, adding cost and degrading performance from the addition of more Muxes to undo the suggested combination . . . to achieve the tunable laser use case." *Id.*

Appellant's contention is unpersuasive of reversible Examiner error. Initially, we are unpersuaded the combination would frustrate an intended purpose of Levinson of, according to Appellant, including an adjustable wavelength or tunable laser with remote or centralized control. Levinson identifies a problem of prior art optoelectronic transceivers is that, using the GBIC standard, transceiver operations are reliant on a host device to control functions such as reset and shutdown. Levinson ¶¶ 5–6. Thus, a problem using the GBIC standard is that a malfunction of the host device adversely affects the associated transceiver. *Id.* ¶ 6. Levinson also discloses another problem is that prior art systems using the GBIC standard are inflexible. *Id.* Levinson's solution to address these problems is to provide "an optoelectronic device that has an assigned network address (e.g., Internet Protocol address) and participates in in-band traffic for purposes of performing functions (e.g., network diagnostics, network control, network provisioning, fault isolation, etc.) that are traditionally performed by host equipment." *Id.* ¶ 8. Thus, an intended use of Levinson is to provide remote control of optical transceiver functions which may include, among others, laser diode wavelength control. *See id.* ¶¶ 31–39. That is, although an embodiment of Levinson uses an adjustable wavelength or tunable laser (a

feature that may be important in DWDM systems (*id.* ¶ 38)), we disagree modifications that detract from use in that embodiment would frustrate the intended use of Levinson to provide remote control of an optical transceiver. Furthermore, although devices including tunable lasers as described by Levinson may be used in a DWDM system, such use does not necessarily foreclose other uses of tunable laser devices.

Appellant's argument is further unpersuasive because, rather than presenting evidence, Appellant provides examples of supposed increased costs of a DWDM system incorporating a resultant combined device. However, even if the overall cost of the resultant DWDM system were proved to be greater, Appellant does not provide evidence that any additional cost would be unwarranted in all cases. Merely knowing the combination increases system costs does not indicate whether such combination would have been nonobvious to persons of ordinary skill in the art. *See Orthopedic Equip. Co. v. United States*, 702 F.2d 1005, 1013 (Fed. Cir. 1983) ("[T]he fact that the two disclosed apparatus would not be combined by businessmen for economic reasons is not the same as saying that it could not be done because skilled persons in the art felt that there was some technological incompatibility that prevented their combination."); *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) ("[A] given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine."); *Winner Int'l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 n.8 (Fed. Cir. 2000) ("The fact that the motivating benefit comes at the expense of another benefit, however, should not nullify its use as a basis to modify the disclosure of one reference with the teachings of another.").

M. Unsatisfactory for Intended Purpose

Appellant additionally alleges "the rejection is improper as it would negatively frustrate a primary purpose of Levinson and therefore [there would have been] no reason to combine [Levinson with Huang and Tan]." Appeal Br. 24. We disagree for the reasons described above in connection with contention L.

N. System Cost Reduced

The Examiner finds incorporating Huang and Tan's bidirectional scheme into the system of Levinson would allow use of a single fiber such that "system cost can be reduced." Final Act. 6. Appellant contends the additional cost of adding Huang's modules to Levinson's optical transceiver necessarily increases rather than reduces system costs, rendering the combination improper. Appeal Br. 25. The Examiner responds, finding Huang's added circulator is a low-cost item while "two fibers cost more than one fiber." Ans. 68.

We are unpersuaded by Appellant's argument. Although there may be additional costs in providing an optical combining device such as an optical circulator, we agree with the Examiner in finding such additional cost may be partially or entirely offset by decreasing the number of optical fibers/cables needed. Even if otherwise, for the reasons discussed above, we disagree cost is a determinative, much less a dispositive factor in deciding whether it would have been obvious to combine the teachings of the references.

For the reasons discussed above, we sustain the rejection of claims 1, 2, 10, and 13 under pre–AIA 35 U.S.C. § 103(a) over Levinson, Huang, and Tan. We further sustain the rejection of claim 5 under pre–AIA 35 U.S.C.

§ 103(a) over Levinson, Huang, Tan, and Medina, that claim being argued on the basis of claim 1. Appeal Br. 27.

O. Physical Layer and Data Link Layer Network Addressing (Claim 3)

3. The pluggable optical transceiver module of claim 1, wherein the protocol processor manages the transmission and reception of data link layer communications including one or more of the following functions comprising:
encapsulating user data into data link layer frames;
frame synchronization;
forward error correction;
physical layer addressing;
data link layer network identification addressing;
data packet queuing;
prioritizing of bandwidth allocations; and
operation administration and maintenance (OAM) message processing.

In connection with claim 3, the Examiner finds Levinson's transceiver, having an assigned IP address, teaches or suggests physical layer addressing and data link layer network identification addressing. Final Act. 7 (citing Levinson ¶¶ 43–58).

Appellant contends "there is no support for [the asserted] teaching in the cited paragraphs [of Levinson]." Appeal Br. 25. Appellant argues, rather than using the data link layer (i.e., OSI layer 2) for network identification addressing, "Levinson teaches IP or network layer addressing (i.e., OSI layer 3) and therefore teaches away from the Examiner's position." *Id.*

The Examiner responds, finding Levinson's transceiver operates in the physical layer. Ans. 70. The Examiner further finds Levinson "detects and possibly corrects errors that may occur in the physical layer' etc., therefore, Levinson teaches/suggests the data link layer." *Id.* at 71. The

Examiner explains:

> Levinson discloses the OSI layer 3. The physical layer and data link layer are the first and second layers of the open systems interconnection (OSI) model, in which a layer serves the layer above it and is served by the layer below it. Then, Levinson et al teaches/suggests that the protocol processor manages the transmission and reception of data link layer communications including the following functions comprising physical layer addressing, and/or data link layer network identification addressing.

Id.

Appellant replies:

> [D]evices or entities (e.g., software applications) that operate at an OSI layer do so without regard to the addressing operation below or above its OSI layer that a device or entity is designed to operate at, as this addressing operation is the concern of other OSI layer devices or entities that operate below or above. For example, Levinson control circuit 150 that includes protocol processor 350' operates at OSI layer 3, having an IP address (i.e., an OSI layer 3 address) and is unconcerned about data link layer (OSI layer 2) or physical layer addressing.

Reply Br. 12. Appellant concludes "the destination address [used by Levinson] is an IP address [such] that Levinson teaches away from using physical layer or data link layer addressing and thus teaches away from the Examiner's rejection to claim 3." *Id.*

Appellant's argument is unpersuasive of reversible Examiner error. Levinson employs OSI layers 1 and 2 (i.e., the physical and data link layers) and uses OSI layer 3 (i.e., IP) addressing. Because, as found by the Examiner, Levinson teaches or suggests that a protocol processor manages the transmission and reception of data link layer communications, we agree Levinson further suggests physical layer addressing and/or data link layer

network identification addressing. Furthermore, because Levinson explicitly provides IP addressing and the use of both physical and data link layers, the combination at least suggests the use of addressing at those layers.

We further note in passing and without reliance in arriving at our decision that several of the other functions recited in the alternative by claim 3 are described in the prior art of record, as follows:

encapsulating user data into data link layer frames: *See*, *e.g.*, Final Act. 22 (with respect to claim 15): "Regarding the encapsulating/de-encapsulating the payload data in the Ethernet MAC, it is a common operation in the MAC, Masucci et al discloses the data link layer encapsulation (Figures 3-8, and column 6 line 1 to column 7 line 13)."

frame synchronization: *See, e.g.*, Xu col. 4, ll. 1–4; Johnston Abstract, col. 5, ll. 50–55; col. 16, ll. 9–10.

forward error correction; *See, e.g.*, Final Act. 16 (Cox et al. discloses that forward error correction can be implemented in a transceiver (312 in Figure 3); Cox ¶¶ 16, 33, 61.

data link layer network identification addressing: *See, e.g.*, Final Act. 7; Levinson ¶¶ 43–58; Scarmalis col. 5, ll. 43–45 ("The [data link] protocol Q.922, among other things, includes an address header that is applied to a data packet and provides the addressing for the frame relay packet.")

data packet queuing: *See, e.g.*, Song ¶¶ 120–21, 225, 244; Masucci col. 4, ll. 9, 51, col. 6, ll. 26–62.

prioritizing of bandwidth allocations: *See*, *e.g.*, Final Act. 13, 18, 27; Ans. 12–13, 17, 26, 47–48; Wang ¶ 51 ("The [optical line terminating (OLT) network device] may use this traffic information to prioritize traffic to enable high priority traffic to displace lower priority traffic.")

operation administration and maintenance (OAM) message processing: *See*, *e.g.*, Masucci (Figs. 3, 6, 8, col. 7, ll. 49–51; col. 8, ll. 32–33;

col. 10, ll. 30–35, 56–59; Wang ¶¶ 50 (Table 1), 52, 54.

For the reasons discussed above, we sustain the rejection of claim 3 under pre–AIA 35 U.S.C. § 103(a) over Levinson, Huang, and Tan.

P) Claims 14, 16, and 20

> 14. A method of communicating from an optical transceiver module for an optical network, the optical transceiver module having a pluggable form factor and adapted to removably couple to an optical module port of a switch, router or media converter, the method comprising:
>
> conveying a first electrical signal through an electrical network interface port to a protocol processor;
>
> processing the first electrical signal in accordance with an Open Systems Interconnect (OSI) Layer 3 protocol by the protocol processor and wherein the first electrical signal includes an OSI Layer 3 network address associated to the optical transceiver module;
>
> modifying a parameter of the optical transceiver module responsive to processing the first electrical signal wherein the parameter is selected from one or more of the following functions comprising: modifying quality of service (QoS) of data traffic, subscriber service provisioning and deprovisioning, modifying subscriber bandwidth allocations or grants, reporting optical transceiver alarm or optical transceiver diagnostics;
>
> generating a second electrical signal in accordance with the OSI Layer 3 protocol by the protocol processor and wherein the second electrical signal includes the OSI Layer 3 network address associated to the optical transceiver module;
>
> conveying the second electrical signal through the electrical network interface port to the switch, router or media converter.

The Examiner finds Levinson teaches the limitations of claim 14 except for a physically pluggable/removable port, for which the Examiner

applies Tan. Final Act. 19. According to the Examiner, "it would have been obvious . . . to apply the bidirectional scheme as taught by Tan . . . and widely used in the art to the system/method of Levinson . . . so that a single fiber can be used for signal transmission, and system cost can be reduced." *Id.* Appellant contends "the stated motivation to combine is the same as that used in the rejection to claim 1 above and is drawn to Appellant['s] optical interface port which is not expressly part of Appellant['s] claim 14." Appeal Br. 26. The Examiner responds, providing reasons why the pluggable form factor of Tan would be incorporated into Levinson's device. Ans. 73[10].

We find the Examiner's foregoing rationale constitutes articulated reasoning with rational underpinnings sufficient to justify the legal conclusion of obviousness. Accordingly, we sustain the rejection of claims 14 and 20 under pre–AIA 35 U.S.C. § 103(a) over Levinson and Tan. We further sustain the rejection of claim 16 under pre–AIA 35 U.S.C. § 103(a) over Levinson, Tan, Masucci, Benton, Scarmalis, and Medina, that claim

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[10] The pluggable form factor transceiver allows users to easily adapt to various fiber optic or copper networking standards and to select the appropriate transceiver for each link to provide the required optical reach over the available optical fiber type. The pluggable transceiver modules can be easily interchanged, and electro-optical or fiber optic networks can be upgraded and maintained more conveniently than has been the case with traditional soldered-in modules. Rather than replacing an entire circuit board containing several soldered-in modules, a single module can be removed and replaced for repair or upgrading. This can result in a substantial cost savings, both in maintenance and in upgrading efforts.

Ans. 73.

being argued on the basis of claim 14. Appeal Br. 27.

DECISION

We affirm the Examiner's rejections of claims 1–22 under 35 U.S.C. § 103.

Claims Rejected	35 U.S.C.	Reference(s)/Basis	Affirmed	Reversed
1–3, 10, 13	§ 103	Levinson, Huang, Tan	1–3, 10, 13	
4	§ 103	Levinson, Huang, Tan, Masucci, Denton	4	
5	§ 103	Levinson, Huang, Tan, Medina	5	
6, 8	§ 103	Levinson, Huang, Tan, Song, Xu	6, 8	
7	§ 103	Levinson, Huang, Tan, Wang	7	
9	§ 103	Levinson, Huang, Tan, Johnston	9	
11	§ 103	Levinson, Huang, Tan, Ethridge	11	
12	§ 103	Levinson, Huang, Tan, Ethridge, Cox	12	
14, 20	§ 103	Levinson, Tan	14, 20	
15	§ 103	Levinson, Tan, Masucci, Denton, Scarmalis	15	
16	§ 103	Levinson, Tan, Masucci, Benton, Scarmalis, Medina	16	
17, 19	§ 103	Levinson, Tan, Song, Xu	17, 19	
18	§ 103	Levinson, Tan, Wang	18	
21	§ 103	Levinson, Tan, and Ethridge	21	
22	§ 103	Levinson, Tan, Ethridge, Cox	22	
Overall Outcome			1–22	

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv). *See* 37 C.F.R. § 41.50(f).

AFFIRMED