

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

QUALCOMM INCORPORATED,
Petitioner,

v.

FEDEX CORPORATE SERVICES, INC.,
Patent Owner.

IPR2022-00586
Patent 9,182,231 B2

Before JEAN R. HOMERE, BARBARA A. PARVIS, and
CHRISTOPHER L. OGDEN, *Administrative Patent Judges*.

OGDEN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining Some Challenged Claims Unpatentable
Dismissing Patent Owner's Motion to Exclude
35 U.S.C. § 318(a)

I. INTRODUCTION

In response to a Petition (Paper 1, “Pet.”) filed by Petitioner Qualcomm Incorporated (“Qualcomm”), the Board instituted an *inter partes* review of claims 1–30 of U.S. Patent No. 9,182,231 B2 (Ex. 1001, “the ’231 patent”). Paper 15 (“Dec.”); Ex. 1031 (public redacted version). Patent Owner FedEx Corporate Services, Inc. (“FedEx”) filed a Patent Owner Response (Paper 43 (“PO Resp.”); Ex. 1034 (public redacted version)), Qualcomm filed a Reply to the Patent Owner Response (Paper 48 (“Pet. Reply”); Paper 49 (public redacted version)), and FedEx filed a Sur-reply (Paper 59 (“PO Sur-reply”); Ex. 1036 (public redacted version)).¹

FedEx filed a motion to terminate the proceeding on the ground that Qualcomm had failed to accurately identify all real parties in interest. Paper 60. We separately denied that motion (Paper 77), and this decision does not further address the issues raised in that motion.

FedEx filed a Motion to Exclude Evidence (Paper 64), to which Qualcomm submitted an Opposition (Paper 65) and FedEx submitted a Reply (Paper 66).

We held an oral hearing on August 8, 2023, and the transcript is entered on the record. Paper 75.

This is a final written decision under 35 U.S.C. § 318(a) as to whether the claims challenged in the *inter partes* review are unpatentable. For the reasons below, we conclude that Qualcomm has shown that some of the challenged claims are unpatentable on at least one ground of the Petition.

¹ In this decision, we refer only to non-confidential portions of the papers filed under seal, which may be found in the public redacted versions.

II. BACKGROUND

A. RELATED PROCEEDINGS

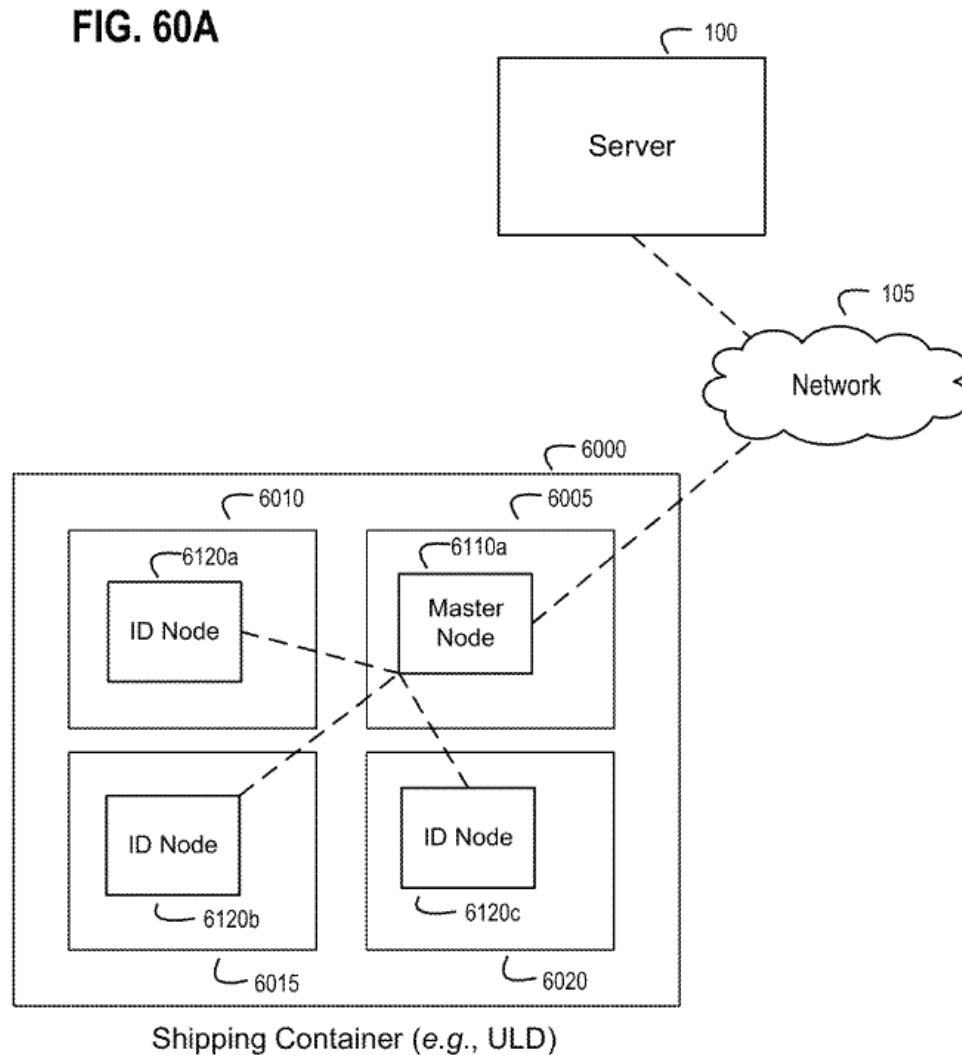
According to the parties, the following is a related U.S. district court case that involves the '231 patent: *FedEx Corporate Services, Inc. v. Roambee Corp.*, No. 1:21-cv-00175 (D. Del. filed Feb. 9, 2021). Pet. 3; Paper 3, 1.

FedEx also identifies the following *inter partes* reviews between the parties challenging related patents: IPR2022-00584 (instituted Oct. 11, 2022), IPR2022-00585 (instituted Oct. 11, 2022), and IPR2022-00587 (institution denied Oct. 11, 2022). Paper 3, 1.

B. THE '231 PATENT (EX. 1001)

The '231 patent is directed to “a hierarchical sensor network for enhanced monitoring of a grouped set of packages being shipped.” Ex. 1001, code (57). The hierarchy involves a server that can communicate with a mobile master node in one of the packages over a first communication path, which in turn can communicate over a second communication path with ID nodes placed in other packages, while the ID nodes do not themselves communicate directly with the server over the first communication path. *Id.*

Figure 60A, reproduced below, depicts such an embodiment:



This figure illustrates a “group of nodes associated with a multi-piece shipment of packages in an exemplary shipping container.” Ex. 1001, 212:1–3. Shipping container 6000 carries packages 6005, 6010, 6015, and 6020. *Id.* at 212:5–6, 213:29–32. Each package has a network device: master node 6110a is inside package 6005 and ID nodes 6120a–c are inside packages 6010, 6015, and 6020, respectively. *Id.* at 212:6–11.

ID nodes 6120a–c can track their respective packages’ location and monitor shipping conditions. *See* Ex. 1001, 213:53–59. The ID Nodes send

this information to master node 6110a via a short-range communication path such as Bluetooth, as shown above by dashed lines in Figure 60A. Ex. 1001, 212:13–17, 213:60–52. Master node 6110a sends this information to server 100 via network 105. *Id.* at 212:12–13, 213:62–63. Server 100 also keeps track of the associations between nodes and packages. *See id.* at 213:12–21.

C. CHALLENGED CLAIMS AND GROUNDS

Claim 1, representative of the challenged claims, reads as follows:

1. A method for creating a hierarchical sensor network for enhanced monitoring of a grouped set of packages being shipped, the hierarchical sensor network using a wireless node network having a mobile master node, an ID node and a server, comprising:

- [1.a.i] associating, by the server, the mobile master node with one of the packages in the grouped set of packages,
- [1.a.ii] wherein the mobile master node is operative to communicate directly with the server in the wireless node network over a first communication path;
- [1.b.i] associating, by the server, the ID node with another of the packages in the grouped set of packages,
- [1.b.ii] wherein the ID node is operative to communicate directly with the mobile master node over a second communication path
- [1.b.iii] but not operative to communicate directly with the server over the first communication path; and
- [1.c] creating the hierarchical sensor network for the grouped set of packages with the mobile master node and the ID node when the server associates the mobile master node with the ID node.

Ex. 1001, 415:61–416:14 (Qualcomm’s reference numbers added in brackets). Claims 10, 16, and 26 are also independent, and the remainder of

the claims each depend from one of these four independent claims. *See id.* at 416:15–419:3.

Qualcomm argues two grounds for *inter partes* review as summarized in the following table:

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1–27, 29, 30	103 ²	Lau, ³ Benson ⁴
28	103	Lau, Benson, Harring ⁵

Pet. 5.

D. DECLARATORY TESTIMONY

Qualcomm relies on a declaration of Dr. Michael Kotzin. Ex. 1002.
FedEx relies on a declaration by Dr. Kevin Almeroth. Ex. 2200.

III. MOTION TO EXCLUDE

FedEx filed a Motion to Exclude (Paper 64, “MTE”), Qualcomm filed an Opposition (Paper 65, “MTE Opp’n”), and FedEx filed a Reply (Paper 66, “MTE Reply”). In its Motion to Exclude, FedEx moves to exclude Exhibits 1010, 1014, 1026, 1027, and 2049. MTE 1. FedEx relies on

² 35 U.S.C. § 103 (2012); Leahy–Smith America Invents Act, Pub. L. No. 112-29 § 103, sec. (n)(1), 125 Stat. 284, 287, 293 (2011) (effective Mar. 16, 2013, which precedes the earliest priority date asserted in the ’231 patent).

³ Lau et al., US 7,212,829 B1, issued May 1, 2007 (Ex. 1004). Qualcomm contends that Lau is prior art under § 102(a)(1). Pet. 5.

⁴ Benson et al., US 2007/0002139 A1, published Jan. 4, 2007 (Ex. 1006). Qualcomm contends that Benson is prior art under § 102(a)(1). Pet. 5.

⁵ Harring et al., US 9,501,920 B2, filed June 6, 2013, issued Nov. 22, 2016 (Ex. 1009). Qualcomm contends that Harring is prior art under § 102(a)(2). Pet. 5.

Exhibits 1010 and 1014 in its Petition, and on Exhibits 1026, 1027, and 2049 in its Reply. We separately decided the Motion to Exclude as to Exhibit 2049 as part of our Order denying Patent Owner’s Motion to Terminate. *See generally* Order Denying Patent Owner’s Motion to Terminate.

We do not rely on Exhibits 1010, 1014, 1026, or 1027 for any determinations or findings in this decision. *See infra* note 10 (noting the context in which Ex. 1014 has been cited). When we use the phrase “evidence of record” or other similar terms or phrases, we are referring to the evidence of record except that evidence that is the subject of FedEx’s Motion to Exclude, that is, Exhibits 1010, 1014, 1026, 1027, and 2049. Accordingly, Patent Owner’s Motion to Exclude as to Exhibits 1010, 1014, 1026, and 1027 is *dismissed* as moot.

IV. GROUNDS OF THE PETITION

For the reasons below, we determine that Qualcomm has shown, by a preponderance of the evidence, that claims 1–15, 26–30 of the ’231 patent are unpatentable as obvious over Lau in view of Benson, and in the case of claim 28, further in view of Harring. Qualcomm has not shown, by a preponderance of the evidence, that claims 16–25 are unpatentable.

A. LEVEL OF ORDINARY SKILL IN THE ART

The level of ordinary skill in the pertinent art at the time of the invention is a factor in how we construe patent claims. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc). It is also one of the factors we consider when determining whether a patent claim is obvious over the prior art. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

To assess the level of ordinary skill, we construct a hypothetical “person of ordinary skill in the art,” from whose vantage point we assess obviousness and claim interpretation. *See In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998). This legal construct “presumes that all prior art references in the field of the invention are available to this hypothetical skilled artisan.” *Id.* (citing *In re Carlson*, 983 F.2d 1032, 1038 (Fed. Cir. 1993)).

Relying on Dr. Kotzin’s testimony, Qualcomm argues that a person of ordinary skill in the art “would have had at least a bachelor’s degree in electrical engineering, computer engineering, or a related field, and . . . two years of experience in design, development and/or testing of hardware and software used in wireless sensor-based networks and associated software, or the equivalent.” Pet. 7 (citing Ex. 1002 ¶ 41).⁶

Dr. Almeroth essentially agrees with Qualcomm’s articulation of the level of ordinary skill as expressed above. *See* Ex. 2200 ¶¶ 45–46. Because Qualcomm’s uncontroverted articulation of the level of ordinary skill in the art is supported by testimonial evidence by both parties and appears consistent with the types of problems and solutions in the ’231 patent, we adopt it for this decision. *See, e.g.*, Ex. 1001, 1:16–2:37 (“Field of the Disclosure” and “Background” sections of the ’231 patent, describing background knowledge about methods for tracking packages using wireless sensor devices).

Qualcomm also contends that an ordinarily skilled artisan “would have been familiar with the field of technology described [on pages 7–13 of

⁶ Qualcomm argues that this is “at least” the level of ordinary skill in the art. Pet. 7. As we did in our instituting decision, we disregard this qualification to avoid vagueness. Dec. 19 n.6; Dr. Almeroth agrees. Ex. 2200 ¶ 46.

the Petition].” *Id.* (citing Ex. 1002 ¶ 41). The “Field of Technology” section of the Petition refers to background knowledge of RFID technology and hierarchical sensor networks. *See* Pet. 7–13. Because whether this subject matter is part of the background knowledge in the art is not determinative of our decision, we need not adopt this part of Qualcomm’s articulation of the level of ordinary skill.

B. CLAIM CONSTRUCTION

In an *inter partes* review, we construe a patent claim “using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b).” 37 C.F.R. § 42.100(b) (2023). This generally includes “construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” *Id.* The ordinary and customary meaning of a claim term “is its meaning to the ordinary artisan after reading the entire patent,” and “as of the effective filing date of the patent application.” *Phillips*, 415 F.3d at 1313, 1321. There are only two circumstances in which a construction departs from the ordinary and customary meaning: “1) when a patentee sets out a definition and acts as [their] own lexicographer, or 2) when the patentee disavows the full scope of a claim term either in the specification or during prosecution.” *Thorner v. Sony Comput. Entm’t Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012). Any such special meaning of a term “must be sufficiently clear in the specification that any departure from common usage would be so understood by a person of experience in the field of the invention.” *Multiform Desiccants Inc. v. Medzam Ltd.*, 133 F.3d 1473, 1477 (Fed. Cir. 1998).

To construe the claim terms, “we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006).

Qualcomm did not initially identify any claim terms needing an explicit construction. *See* Pet. 15. However, FedEx identified two terms for which it offered substantial claim construction arguments: the term “unable to directly communicate with the server” and the term “summary shipment condition information” (claim 26). PO Resp. 35–39. We address these two terms below. To the extent that other claim terms are significant, we discuss them below in the context of the asserted prior art.

1. “*Unable to Directly Communicate with the Server*”

FedEx argues that we should construe the term “unable to directly communicate with the server” to require “a device that lacks the physical capability to communicate directly with the server.” PO Resp. 35 (citing Ex. 2200 ¶¶ 50–54). Based on a dictionary definition, FedEx contends that “[t]he plain meaning of ‘unable’ is ‘incapable.’” *Id.* (citing Ex. 2201, 2481).

FedEx also points to examples in the ’231 patent in which a master node has both short and medium or long range communication interfaces, while an ID node has only a short-range interface. *Id.* at 35–36 (citing Ex. 1001, Figs. 3–4). Thus, according to FedEx, “[t]he ID node . . . lacks the physical circuitry necessary to engage in medium-to-long-range communications.” *Id.* at 36 (citing Ex. 2200 ¶ 52).

FedEx also notes that claims 1, 10, and 16 use the phrase “not operative to” rather than “unable to,” and from this FedEx argues that the terms presumably mean different things. *Id.* at 36–37 (citing *SimpleAir, Inc.*

v. Sony Ericsson Mobile Commc 'ns AB, 820 F.3d 419, 431 (Fed. Cir. 2016); *Comark Commc 'ns, Inc. v. Harris Corp.*, 156 F.3d 1182, 1187 (Fed. Cir. 1998). FedEx contends that “a device ‘not operative to’ communicate with a server (e.g., through programming or other means) may still be capable of communicating with it,” for example if it had circuitry to do so, but that circuitry is disabled by programming. *Id.* at 37 (citing Ex. 2200 ¶ 54).

Qualcomm responds that FedEx’s proposed construction “contradicts the ’231 Patent’s description of smartphone 200 as an example of a user access device that operates as an ID node ‘unable to directly communicate with the server’ in one embodiment.” Pet. Reply 8 (citing Ex. 1001, 110:13–19). In another embodiment, according to Qualcomm, the smartphone “operates as a master node that can ‘directly communicate with the server’ . . . , where the *only* difference is in the app.” *Id.* (citing Ex. 1001, 110:1–26).

As to FedEx’s argument that “unable” is presumed to mean something different from “not operative” in other claims, Qualcomm argues that the “presumption is overcome here because a software difference—not a hardware difference—can render an ID node ‘unable’ to directly communicate with a server, as each of the specification examples above shows.” Pet. Reply 9.

In its Sur-reply, FedEx argues that Qualcomm’s example “mixes language from two distinct embodiments”: in the first embodiment, it is “unable to directly communicate with the server” and in the second embodiment, it “may have an app that *allows it to operate as* a master node in some instances and as an ID node in other instances.” PO Sur-reply 11 (citing Ex. 1001, 110:13–26). FedEx also contends that in this example, the

second embodiment is not necessarily smartphone 200. *Id.* at 12–13 (citing Ex. 1001, 14:59–64, 110:13–15, Figs. 3–4; Ex. 2200 ¶ 52).

Although the '231 patent does appear to describe these as two separate embodiments, the embodiments both include smartphone 200. *See* Ex. 1001, 110:13–14, 19–20, 23–26. We find persuasive Qualcomm's argument that the only apparent difference between the two embodiments is that in the second one, smartphone 200 has an app that allows it to use hardware capable of directly communicating with the server. In other words, the distinction is a matter of programming: the smartphone 200 is both "unable" and "not operable to" communicate with a server when it is not presently configured that way through software. This is inconsistent with Dr. Almeroth's opinion that a device would not be "unable to directly communicate with the server" if it "ha[s] the circuitry components necessary to communicate with a server but simply lack the programming to do so presently." Ex. 2200 ¶ 54. Thus, we do not find his testimony credible on this point.

Regarding FedEx's term-differentiation argument, we agree with Qualcomm that, based on the above evidence in the '231 patent disclosure, there does not appear to be any meaningful difference between "unable to" and "not operative to" as those terms appear in the claims.

Thus, we disagree with FedEx's proposed construction of "unable to directly communicate with the server." Our prior-art analysis below will be informed by the discussion above, but we need not explicitly construe this term to resolve the issues raised in the Petition. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("[W]e need only construe terms 'that are in controversy, and only to the

extent necessary to resolve the controversy’” (quoting *Vivid Techs., Inc. v. Am. Sci & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

2. “*Summary Shipment Condition Information*” (Claim 26)

FedEx argues that we should construe “summary shipment condition information” (claim 26) to mean “a condensed form of shipment condition information.” PO Resp. 38. Based on dictionary definitions, FedEx argues that the word “‘summary’ indicates some degree of distillation or summarization.” *Id.* (citing Ex. 2201, 2289; Ex. 2202, 1255; Ex. 2203, 1745). FedEx also argues that in claim 26, the summary shipment condition information is “*based upon* the collected shipment condition information,” suggesting that it is different from the collected shipment condition information. *Id.* (quoting Ex. 1001, 418:52–54).

FedEx also points to a passage in the ’231 patent describing alleged embodiments of summary shipment condition information as, for example, a “limited portion of the data” or a “summary of the data,” suggesting that it is not an exact copy of the information being summarized. PO Reply 38–39 (citing Ex. 1001, 159:39–44). Finally, FedEx argues that construing the term to include a collection of uncondensed shipment information would render the word “summary” superfluous. *Id.* at 29.

Qualcomm points out that according to the ’231 patent, “summary shipment condition information ‘may be a compilation of environmental and location information collected related to packages in the set of packages.’” Pet. Reply 9 (quoting Ex. 1001, 216:41–44); *see also* Pet. 60. According to Qualcomm, Dr. Almeroth testified at deposition that he did not think that a “compilation” “means a summary,” thus undermining FedEx’s claim construction argument. *Id.* at 9–10 (citing Ex. 1022, 60:5–61:7).

In its Sur-reply, FedEx responds that the word “compilation” in this passage of the ’231 patent “is not at issue” because it “simply indicates the *type* of data that may be included in a summary, but “[t]he plain meaning of ‘summary’ does not encompass an unabridged *compilation*.” PO Sur-reply 13–14 (citing Ex. 1001, 216:41–44).

Having considered the evidence of record, we regard the passage in column 216 of the ’231 patent as at least partially definitional, in that it indicates that “summary shipment condition information” can, at least in one case, be a “compilation” of collected information. Nothing in this passage suggests that this information is abridged or shortened. Thus, we disagree with FedEx’s proposed construction of “summary shipment condition information.” We interpret “summary shipment condition information” to at least include “a compilation of environmental and location information collected related to packages in the set of packages.” Ex. 1001, 216:42–44.

C. ANALYSIS

We now turn to the grounds of the Petition, which assert that claims 1–30 are obvious over Lau in view of Benson, and in the case of claim 28, in further view of Harring. *See* Pet. 5.

A claim is unpatentable under § 103 for obviousness “if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains.” 35 U.S.C. § 103; *see also KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). For a combination of known elements that are not explicitly found together in the prior art, we

consider “whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *Id.* at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

We base our obviousness inquiry on factual considerations 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) any objective indicia of obviousness or non-obviousness that may be in evidence. *See Graham*, 383 U.S. at 17–18.

Considering these factors,⁷ we determine that Qualcomm has shown, by a preponderance of the evidence, that claims 1–15 and 26–30 are unpatentable under § 103 on the asserted grounds, but has not shown that claims 16–25 are unpatentable.

1. Overview of Lau

Lau describes “approaches for monitoring status of articles being shipped” which “can produce notifications to interested parties.” Ex. 1004, code (57), 2:40–43. Figure 1, reproduced below, shows an example:

⁷ Neither party presents evidence of objective indicia of obvious or non-obviousness, so no such evidence factors into our decision.

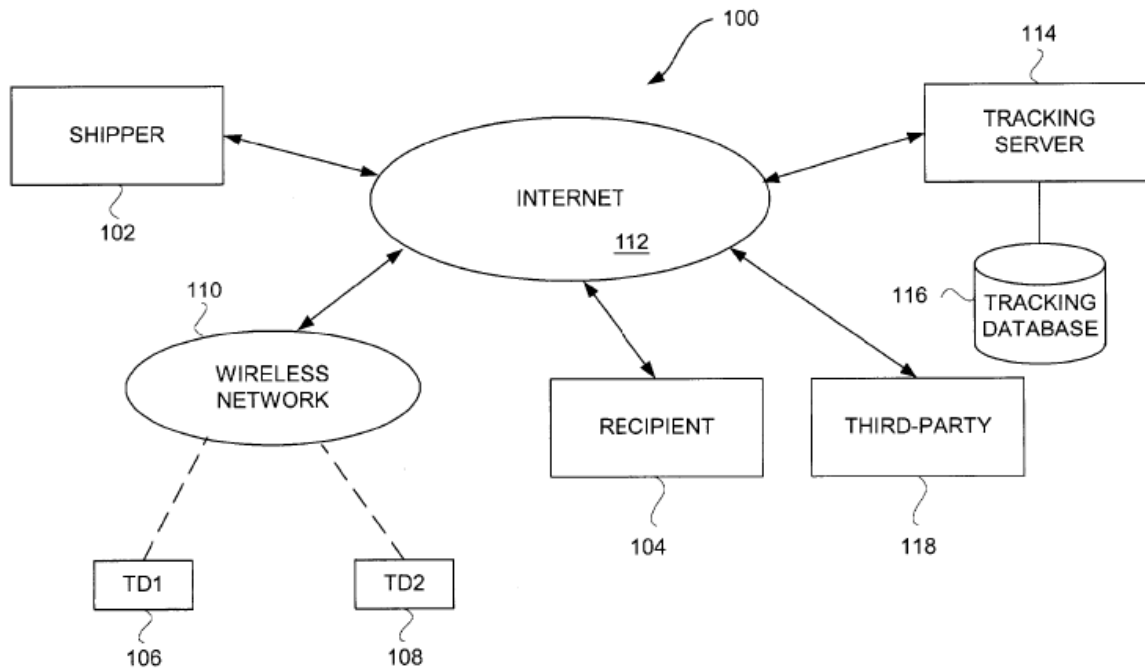


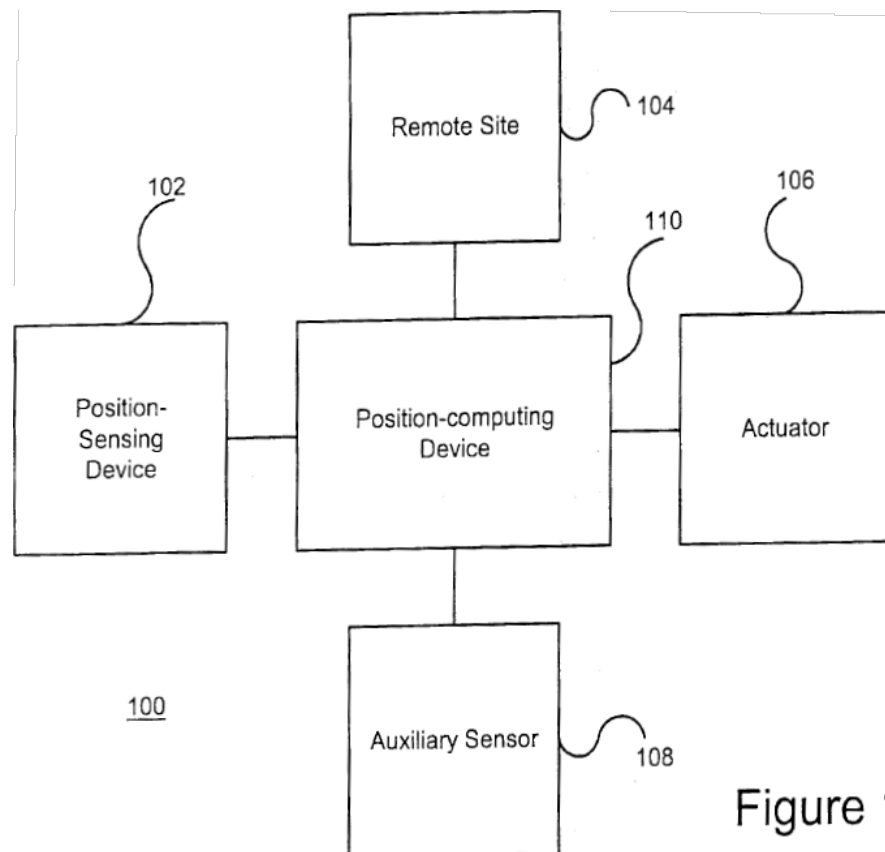
FIG. 1

As shown above, Figure 1 is a block diagram of article shipping system 100 which includes shipper 102 (“a person, entity or associated computing device that is responsible or associated with shipping an article”) and recipient 104 (“a person, entity, or associated computing device to which the article is being shipped”). Ex. 1004, 4:21–37. Tracking devices 106 and 108 are “provided within or attached to” articles being shipped, and are “coupled to a wireless network 110” which is, in turn, coupled to the internet 112. *Id.* at 4:38–50. Also connected to the internet 112 is tracking server 114, which connects to tracking database 115. *Id.* at 4:51–53.

During transport of an article from shipper 102 to recipient 104, tracking device 106 obtains “position (location) information and/or shipping conditions information” such as “vibration, acceleration, speed, or direction of travel of, or force or pressure on, the article,” or environmental conditions as temperature, humidity, and pressure, or wind speed. Ex. 1004, 4:56–5:9.

Tracking device 106 sends this status information to tracking server 114 via wireless network 110 and internet 112. *Id.* at 5:10–13. Tracking server 114 then stores the information in tracking database 116 “such that it is associated with the particular article being shipped.” *Id.* at 5:13–16. Tracking server 114 likewise monitors the status information associated with other tracking devices such as 108. *See id.* at 5:20–23.

Lau incorporates provisional application US 60/444,198 (filed Jan. 30, 2003) (Ex. 1005) by reference. Ex. 1004, 1:17–22, 16:10–18. The Lau provisional application describes a position-tracking embodiment as depicted below in its Figure 1:



As shown above, Figure 1 of the Lau provisional application depicts position-sensing device 102 coupled to position-computing device 110

which is in turn coupled to remote site 104. Ex. 1005, 50:6–8. Position-sensing device 102 is designed to be “very portable” so that it “can easily affix [it] to a person, package or other object.” *Id.* at 50:13–14. Position-computing device 110 “can receive the raw position data from the position-sensing device 102 and then forward the raw position data (or a partially processed version thereof) to [a server at remote site 104] for additional processing.” *Id.* at 50:19–22.

The Lau provisional discloses that communication between position-sensing device 102 and position-computing device 110 may be “via a Bluetooth network or a wireless LAN,” where “position-computing device 110 can be placed anywhere within the signal reception range of the wireless link from the position-sensing device 102.” Ex. 1005, 51:19–23. “In one embodiment, the position-sensing device 102 does not have any user input/output interface other than a link (e.g., wireless link) to the position computing device 110.” *Id.* at 51:1–3. The Lau provisional also discloses that communication between position-computing device 110 and remote site 104 may be “through a local area network, or a wide area or global network.” Ex. 1005, 53:16–17.

2. *Overview of Benson*

Benson describes a system for “monitoring remotely located objects with a system comprised of at least one master data collection unit, any number of remote sensor units, and a central data collection server.” Ex. 1006, code (57). Benson teaches that the master unit “can be configured to monitor any object, mobile or stationary,” that it may, in one embodiment, be “attached to a mobile object,” and that “[t]he master unit may act as a parent controller for one or more child devices, wherein child devices can be

remote sensors or monitors of various measurable conditions including environmental conditions.” *Id.* ¶ 26.

In one embodiment in which redundancy “adds to the reliability of the system,” “master units and remote sensor units can communicate over at least two communication links to at least two other entities.” Ex. 1006 ¶ 29. In such a system with multiple communication paths, telemetric communicators associated with each package send location or environmental data over a first communication link to a coordinating device, but “if the first communication link is not available . . . , the telemetric communicator is configured to transmit the sensed information to another telemetric communicator contained in another one of the packages.” *Id.* ¶ 96.

However, “[i]n some embodiments, the remote sensor unit acts as a subordinate device to the master unit, e.g., only doing a subset of the master device functions, e.g., not communicating with the central data collection server directly.” *Id.* ¶ 50.

Figure 4, reproduced below, is a flowchart showing processing that occurs in a master unit (Ex. 1001 ¶ 60):

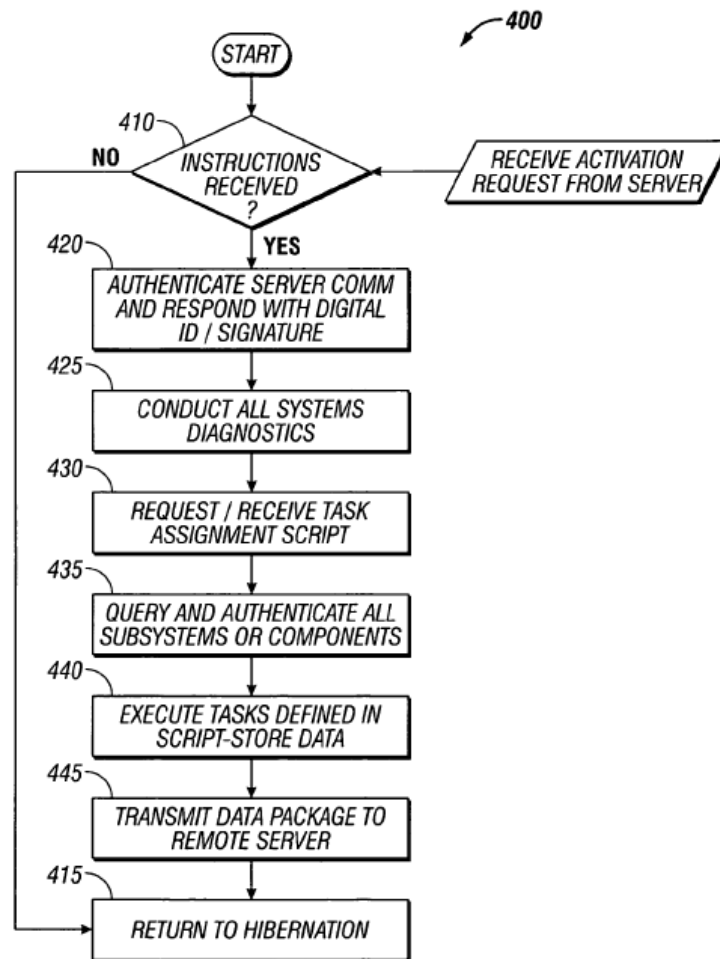


FIG. 4

Figure 4, above, depicts process 400 which “typically starts in a hibernation state. The master unit then transfers out of the hibernation state to step 410 in order to monitor one or more communication links for incoming instructions” such as from the server. Ex. 1006 ¶ 60. This monitoring at step 410 “can be continuous, periodic, or random” (*id.*), and the flowchart includes a box and an arrow indicating that step 410 follows, in some way, a step of receiving an “activation request.” If, after awakened from hibernation, the process receives no instructions, it “proceeds to step 415 where it returns to the hibernation state.” *Id.* Otherwise, the process proceeds

with a series of steps, one of which is to “receive task assignment script” which provides tasks for the master unit to perform. *Id.* ¶¶ 60, 62, 83.

3. *Combination and General Motivation to Combine Lau and Benson*

Generally, as to its first ground, Qualcomm argues that a person of ordinary skill in the art would have modified Lau’s article shipment notification system 100 by “using Benson’s master units and remote sensor units as tracking devices.” Pet. 24 (citing Ex. 1002 ¶ 66).⁸ Qualcomm also relies on Benson’s teaching that the remote sensor units (corresponding, in Qualcomm’s view, to the “ID nodes” of claim 1) would “only [be] doing a subset of the master device functions,” and thus “not [be] capable of communicating directly with Lau’s tracking server 114.” Pet. 24 (citing Ex. 1006 ¶ 50; Ex. 1002 ¶ 67).

According to Qualcomm, the motivation for an ordinarily skilled artisan to make this modification is, in part, Lau’s teaching that “the article shipment notification system 100 supports many different *tracking devices*.” Pet. 22 (quoting Ex. 1004, 4:45–49) (citing Ex. 1002 ¶ 63). Thus, according to Qualcomm, a person of ordinary skill would have looked to Benson’s hierarchical system, which can likewise track multiple objects. Pet. 22–23 (citing Ex. 1006 ¶¶ 3, 97). And in doing so, Qualcomm contends that the

⁸ Qualcomm contends that Lau and Benson are analogous prior art because both of them are within the “same field of endeavor relating to tracking and monitoring shipped articles.” Pet. 22 (citing Ex. 1004, code (57); Ex. 1006, code (57), ¶ 33). FedEx does not dispute that the references are analogous (*see* PO Resp. 67 (arguing that references are not “combinable simply because they are analogous”)), and we agree with Qualcomm that that they are in the same field of endeavor as the claimed invention.

ordinarily skilled artisan would have taken advantage of Benson’s hierarchical embodiment “to obtain the known benefit of reduced costs for the ‘remote sensor units’ ‘only doing a subset of the master device functions.’” Pet. 23 (quoting Ex. 1006 ¶ 50) (citing Ex. 1002 ¶ 64).

Qualcomm contends that Lau also recognizes this benefit because, in the Lau provisional application, which was incorporated by reference into Lau, the functions of position sensing and position calculating are separated into two devices, so that the position-sensing devices can “be made compact” and “can be made relatively inexpensive,” since they do not need to “include circuitry to perform” the position-sensing function. Pet. 23 (quoting Ex. 1005, 64).

Qualcomm also cites to Ebert et al., US 7,737,857 B2 (issued June 15, 2010) as an evidentiary reference suggesting that a person of ordinary skill would have known that Benson’s hierarchical modification to Lau’s system would have decreased “communication volume and item history storage costs” by aggregating data at the master node. Pet. 23 (quoting Ex. 1018, 10:15–17) (citing Ex. 1002 ¶ 64). Qualcomm also cites another evidentiary reference, Altman et al., US 2017/0070847 A1 (filed Nov. 17, 2016; published Mar. 9, 2017; claiming priority to an application filed Feb. 21, 2013) to suggest that a person of ordinary skill in the art would have understood that using a hierarchical system such as that in Benson would have enabled “low power consumption” by using “a relatively short effective . . . range” communication protocol between the master node and ID node. Pet. 23 (alteration in original) (quoting Ex. 1019 ¶ 128) (citing Ex. 1002 ¶ 64).

Finally, Qualcomm argues that a person of ordinary skill in the art would have understood that incorporating Benson’s hierarchical system into Lau would have improved security because the master nodes would be able to authenticate the remote sensors by transmitting the remote sensor’s identification information to the central server for approval. Pet. 23–24 (citing Ex. 1006 ¶¶ 49, 84; Ex. 1002 ¶ 65).

FedEx first argues that “Qualcomm’s obviousness analysis improperly relies on hindsight.” PO Resp. 64. According to FedEx, “Benson entirely subsumes any of the structural components described in Lau,” such as Benson’s Master Unit 1 which is duplicative of Lau’s tracking devices TD1 and TD2. *Id.* at 65 (citing Ex. 2200 ¶ 78). FedEx also contends that there would be no “reason to import Lau’s server into Benson,” which “already includes its own central data collection server 125.” *Id.* (citing Ex. 1006 ¶ 36; Ex. 2200 ¶ 78). Thus, according to FedEx, “Lau adds nothing to the system already described in Benson,” so Qualcomm could not have asserted Benson as the primary reference. *Id.* at 65–66 (citing Ex. 2200 ¶ 78; *Cisco Sys., Inc. v K.Mizra LLC*, IPR2021-00593, Paper 41 at 34 (PTAB Sept. 19, 2022)). FedEx argues that “[t]his unnatural combination arises solely due to the Petition’s need to rely on Lau to reach certain claim limitations with the benefit of hindsight. Such contrived combinations cannot stand.” *Id.* at 66 (citing *Cheese Sys., Inc. v. Tetra Pak Cheese & Powder Sys., Inc.*, 725 F.3d 1341, 1352 (Fed. Cir. 2013); *Interconnect Plan. Corp. v. Feil*, 774 F.2d 1132, 1138 (Fed. Cir. 1985)).

Qualcomm disagrees that its obviousness rationale relies on improper hindsight because it “provided and explained motivations that didn’t come from the ’231 Patent.” Pet. Reply 25.

We agree with Qualcomm. The Petition relies on incorporating limited teachings of Benson into Lau’s system, not the other way around, and the asserted motivation to combine is based on these references and the background knowledge in the art, not any teachings of the ’231 patent. *See* Pet. 24–27; *In re McLaughlin*, 443 F.2d 1392, 1395 (CCPA 1971) (“[S]o long as [an obviousness analysis] takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made and does not include knowledge gleaned only from applicant’s disclosure, such a reconstruction is proper.”).

Next, FedEx argues that Qualcomm’s statement that Lau “supports many different tracking devices,” and that “Benson discloses such tracking devices,” only shows that Lau and Benson *can* be combined, not that there is a motivation to combine. PO Resp. 67 (citing Ex. 2200 ¶¶ 67–68; *Pers. Web Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 993–94 (Fed. Cir. 2017); *InTouch Techs., Inc v. VGO Commc’ns Inc.*, 751 F.3d 1327, 1352 (Fed. Cir. 2014); *Smiths Indus. Med. Sys. v. Vital Signs, Inc.*, 183 F.3d 1347, 1356 (Fed. Cir. 1999); *K. Mizra*, IPR2021-00593 at 34); *see also* PO Sur-reply 25–26..

Qualcomm responds that its proposed motivation to combine includes more than just the capability of combination. Pet. Reply 25–26 (citing Pet. 23 (arguing that incorporating Benson’s hierarchical tracking devices into Lau’s system would reduce cost, reduce size and the amount of circuitry, decrease communication volume and item history storage costs, and reduce power consumption)).

We agree with Qualcomm that its proposed rationale for combining Lau with Benson relies on more than that the references *can* be combined.

And it appears that FedEx acknowledges these other rationales because it takes issue with them, as we discuss below.

In particular, FedEx argues that Qualcomm offers a different solution to the problem of reducing costs of the remote sensing units: whereas Lau’s “solution to this problem is merely to remove a keyboard and display from sensor units,” Qualcomm proposes “wholesale elimination of their operative functionality.” PO Resp. 67 (citing Ex. 1005, 50, 64; Ex. 2200 ¶ 70). FedEx also disagrees that using Benson’s tracking devices in Lau’s system would decrease costs, because it would “add[] an entire additional tier of more complex devices to Lau’s tracking system that now must manage multiple disparate sensors.” *Id.* at 67–68 (citing Ex. 2200 ¶ 69). And according to FedEx, “Benson does not, in fact, teach remote sensor units *lacking circuitry* to communicate directly with a server,” or “appreciate any alleged cost savings from removing communication circuitry,” because “the circuitry in [Benson’s] remote and master units is identical.” *Id.* at 68. FedEx also contends that Lau already “provides authorization techniques for security purposes” and Qualcomm “offers no explanation why this authorization is deficient.” *Id.* at 68–69 (citing *Apple Inc. v. Masimo Corp.*, IPR2020-01524, Paper 29, at 47 (PTAB Apr. 29, 2022)).

In its Reply, Qualcomm argues that FedEx mischaracterizes Lau’s proposed solution to reduce costs and size, which suggests more than just removing a keyboard. Pet. Reply 26 (citing Ex. 1005, 65 (suggesting that “the position sensing device does not have to include circuitry to perform processing to calculate its position or determine actions”). Because of this reduction in complexity, Qualcomm also disagrees that its proposed combination would result in “an additional tier of more complex devices.”

Id. Qualcomm also clarifies that its proposed rationale for combining Lau and Benson relies on the benefit of removing master-unit functions from the remote sensor devices, rather than removing circuitry to communicate directly with the server. *Id.* Qualcomm further clarifies that its rationale relies on the benefit Benson’s *device*-authentication procedures, rather than *user*-authentication procedures which Lau already discloses. *Id.* at 27 (citing Ex. 1004, 8:42–45).

Having considered the evidence of record, we determine that Qualcomm has articulated persuasive and specific reasoning sufficient to support a motivation to combine Lau with Benson. *See In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016). In particular, Lau acknowledges a benefit to reducing circuitry and size of remote-sensing units, and Benson presents a solution to that problem by using reduced-functionality remote sensor units in conjunction with master units. *See* Ex. 1005, 65.

Finally, FedEx argues that it is improper for Qualcomm to provide a general motivation to combine Lau and Benson, divorced from the discussion of individual claim elements. PO Resp. 69–71. And according to FedEx, “Qualcomm . . . fails to grapple with the factual determinations required for a proper *Graham* analysis” because “Qualcomm’s abstract approach never resolves the differences between each reference and the claims nor articulates a reason why a [person of ordinary skill in the art] would have looked to the secondary reference to address specific claim features.” *Id.* at 72.

We disagree that there is anything improper with providing a general rationale for combining prior art references, so long as a petitioner also

addresses each claim limitation and it is clear from the petition how the asserted motivation to combine applies to each affected limitation, as is the case here. *See* Pet. 27–62, 68–69. We also determine that Qualcomm has performed a sufficient *Graham* analysis, as we discuss in more detail on a limitation-by-limitation basis below.

4. *Independent Claim 1*

(a) Preamble

The preamble of claim 1 recites “[a] method for creating a hierarchical sensor network for enhanced monitoring of a grouped set of packages being shipped, the hierarchical sensor network using a wireless node network having a mobile master node, an ID node and a server.” Ex. 1001, 415:61–65. Qualcomm contends that Lau, modified by Benson as discussed above (*see supra* Section IV.C.3), teaches a hierarchical sensor network for monitoring a set of packages being shipped, as recited in the preamble, including a mobile master node (Benson’s master unit) and an ID node (Benson’s remote sensor unit). *See* Pet. 27–28 (citing Ex. 1004, Fig. 1; Ex. 1006 ¶¶ 26, 27, 33, 44, 50, 56, 96; Pet. 24–27; Ex. 1002 ¶¶ 72–74).

FedEx does not dispute that Lau discloses the preamble of claim 1. *See* PO Resp. 47–53. Without deciding whether the preamble is limiting, we find Qualcomm’s arguments persuasive.

(b) Limitation 1.a.i

Limitation 1.a.i recites the step of “associating, by the server, the mobile master node with one of the packages in the grouped set of packages.” Ex. 1001, 415:66–67. Qualcomm makes alternative arguments based on two arrangements of the elements in Lau and Benson. For this

decision, we need only address the second arrangement, which is that “the master unit may be attached to an object in the shipping container such that the master unit is attached to a first object and remote sensor units are attached to the remaining objects in the container.” Pet. 26 (citing Ex. 1002 ¶ 70); *see also* Pet. 31 (citing Ex. 1006 ¶ 26 (teaching that the master unit may be “attached to a mobile object”), ¶ 33; Ex. 1002 ¶ 81).

According to Qualcomm, Benson teaches that a master unit may include a GPS module “to track the location of the master unit,” and argues that this further suggests that the system can use a master unit to track an individual package. Pet. 26 (quoting Ex. 1006 ¶ 44) (citing Ex. 1006 ¶ 56 (teaching that a GPS module “is used to track the location of the remote sensor unit”); Ex. 1002 ¶ 70). According to Qualcomm, these disclosures supplement Lau’s discourse that “tracking devices” are attached to each package. *Id.* (citing Ex. 1004, 4:38–41; Ex. 1002 ¶ 70); Pet. 31 (citing Ex. 1004, 4:38–41, 5:10–19; Ex. 1002 ¶¶ 81–83).

Qualcomm also argues that Lau discloses storing, in its server, status information including an association between each tracking device and its corresponding package. Pet. 30 (citing Ex. 1004, 5:10–19, 4:38–41; Ex. 1002 ¶ 79). According to Qualcomm, a person of ordinary skill in the art would have included such an association database, as part of the Lau–Benson combination, to track packages assigned to both the master unit and the remote sensor units. Pet. 30–31 (citing Ex. 1006 ¶ 49; Ex. 1002 ¶ 80); Pet. 31 (citing Ex. 1002 ¶ 81).

In its Response, FedEx argues that in Benson, only the remote sensor units are associated with packages, and the server never associates master units with packages. PO Resp. 47–49 (citing Ex. 1006 ¶¶ 26, 36, Fig. 1B;

Ex. 2200 ¶¶ 78, 81). FedEx also asserts that Qualcomm cannot argue there is an *indirect* association between a master node and a package because the claim requires associating a master node with a package, “not associating the mobile master node with *something else* that is in turn associated with the package.” *Id.* at 49 (citing Ex. 2200 ¶ 84).⁹

In its Reply, Qualcomm argues that in its second arrangement, “master unit 105 is attached directly to [a package]” and that its proposed combination relies on the teachings of both Lau and Benson for associating a master unit with a package. Pet. Reply 16–17 (citing Pet. 31).

In its Sur-reply, FedEx argues that Qualcomm has not shown how Lau teaches associating a master unit with a package, because Qualcomm’s discussion only correlates the “first tracking device” in Lau’s disclosure with a remote sensor unit, not a master unit. PO Sur-reply 19–20 (citing Pet. Reply 14, 16). FedEx also argues that associating a master unit with a package would not make sense because Benson discloses that it can monitor objects entering or leaving the area where it is located, so it need not be associated with any particular package. *Id.* at 20 (citing Ex. 1008 ¶ 26; Ex. 2200 ¶ 86).

We find Qualcomm’s arguments persuasive. As Qualcomm argues in the Petition, Benson teaches that a “master unit can be configured to monitor any object, mobile or stationary,” and may be “attached to a mobile object.” Pet. 26 (quoting Ex. 1006 ¶ 26). This is in addition to the master unit’s

⁹ FedEx makes additional arguments directed to Qualcomm’s alternative “first arrangement” of sensors. *See* PO Resp. 49–51. Because we only consider Qualcomm’s “second arrangement” in our decision, we need not address these arguments.

function of “monitoring multiple remote sensor units associated with the objects being monitored.” Ex. 1006 ¶ 26. We determine that a person of ordinary skill in the art would have understood this to suggest that a master unit may, itself, be associated with a package to be tracked, in addition to communicating with remote sensor units associated with other objects. *See* Ex. 1002 ¶ 70.

We also agree with Qualcomm that in the proposed combination, Lau already teaches associating, by the server, each tracking unit with a package, and this would not change when Lau is modified with the teachings of Benson, as there would still be a need to track all packages associated with tracking units in the combined system, whether those tracking units be master units or remote sensing units. *See* Pet. 26 (citing Ex. 1004, 4:38–41; Ex. 1002 ¶ 70).

Thus, we determine that Qualcomm has shown that the combination of Lau and Benson teaches limitation 1.a.1.

(c) Limitation 1.a.ii

Limitation 1.a.ii recites “wherein the mobile master node is operative to communicate directly with the server in the wireless node network over a first communication path.” Ex. 1001, 415:67–416:3. According to Qualcomm, Benson discloses that its central data collection server (corresponding to the recited “server” in claim 1) “is connected to the master unit via one or more communication links” and communicates over a wireless network. Pet. 32 (quoting Ex. 1006 ¶ 28) (citing Ex. 1006 ¶ 40; Ex. 1002 ¶ 82). Qualcomm argues that “[t]he communication is ‘directly’ because no other node of the wireless sensor network is required to serve as an intermediary.” *Id.* (citing Ex. 1002 ¶ 82).

FedEx does not contest Qualcomm’s contentions regarding limitation 1.a.ii (*see* PO Resp. 47–53), and we find the arguments persuasive.

(d) Limitation 1.b.i

Limitation 1.b.i recites the step of “associating, by the server, the ID node with another of the packages in the grouped set of packages.”

Ex. 1001, 416:4–5. Qualcomm argues that, at least for its second arrangement for limitation 1.a.i, each of Benson’s remote sensor units is associated with a package within the group being shipped. *See* Pet. 33–34 (citing Ex. 1004, 5:10–19, 4:38–41; Ex. 1006 ¶ 33; Ex. 1002 ¶ 83).

FedEx does not contest Qualcomm’s specific contentions regarding limitation 1.b.i (*see* PO Resp. 47–53), and we find the arguments persuasive.

(e) Limitation 1.b.ii

Limitation 1.b.ii recites “wherein the ID node is operative to communicate directly with the mobile master node over a second communication path.” Ex. 1001, 416:5–7. According to Qualcomm, Benson discloses that “[t]he remote sensor units are configured to communicate with the master unit. The communication can be over a secure communication link (the claimed ‘second communication path’).” Pet. 34 (quoting Ex. 1006 ¶ 27) (citing Ex. 1002 ¶ 84). Qualcomm contends that “[t]he communication is ‘directly’ because no other node of the wireless sensor network is required to serve as an intermediary.” *Id.* (citing Ex. 1002 ¶ 84).

FedEx does not contest Qualcomm’s specific contentions regarding limitation 1.b.ii (*see* PO Resp. 47–53), and we find the arguments persuasive. *See, e.g.*, Ex. 1006 ¶ 36 (“Communications can be direct

between the data collection server . . . and the trusted monitoring devices”).

(f) Limitation 1.b.iii

Limitation 1.b.iii recites “but not operative to communicate directly with the server over the first communication path.” Ex. 1001, 416:8–9. According to Qualcomm, Benson discloses that “[i]n some embodiments, the remote sensor unit acts as a slave device to the master unit, . . . *e.g., not communicating with the central data collection server directly.*” Pet. 34 (omission in original). Qualcomm contends that because the remote sensor unit “does not communicate with the central data collection server, . . . it does not communicate directly with the server over the first communication path.” Pet. 34–35 (citing Ex. 1002 ¶ 85).

FedEx does not contest Qualcomm’s specific contentions regarding limitation 1.b.iii (*see* PO Resp. 47–53), and we find the arguments persuasive.

(g) Limitation 1.c

Limitation 1.c recites the step of “creating the hierarchical sensor network for the grouped set of packages with the mobile master node and the ID node when the server associates the mobile master node with the ID node.” Ex. 1001, 416:10–13. Qualcomm argues that Benson teaches the recited hierarchical sensor network when the server sends instructions to a master unit adding a remote sensor to its monitoring schedule as a child device, thus associating the master unit with a remote sensor unit. *See* Pet. 35 (citing Ex. 1006 ¶¶ 26, 49; Ex. 1002 ¶ 86).

FedEx argues that there is a distinction in Benson between a “remote sensor” and a “remote sensor unit,” and Benson only teaches associating master units with the former, not the latter. PO Resp. 51 (citing Ex. 2200 ¶¶ 91–94). According to FedEx, remote sensors connect to remote sensor units through ports. *Id.* at 52–53 (citing Ex. 1006 ¶¶ 49, 54, 73, 75; Ex. 2200 ¶ 92). Thus, FedEx argues that Benson “at most reflects an association between a master unit and a remote *sensor*—not an association between the master unit and a remote *sensor unit*.” *Id.* at 53 (citing Ex. 2200 ¶¶ 93–94). And when this happens, “Benson merely adds a sensor (not a sensor unit) to a master node’s monitoring schedule.” *Id.* (citing Ex. 1006 ¶ 49; Ex. 2200 ¶ 94).

Qualcomm responds that “a remote sensor is one that is necessarily attached to a remote sensor unit,” and “Benson doesn’t distinguish between the remote sensor unit and the attached remote sensor in discussing authentication thereof to a master unit.” Pet. Reply 17–18 (citing Ex. 1006 ¶¶ 54, 64–65, 73; Ex. 1022, 97:8–22). According to Qualcomm, “an association between a master unit and a remote sensor would be meaningless without the remote sensor unit to which the remote sensor were attached” because it would be the remote sensor unit that “communicate[s] the sampled data to the master unit.” *Id.* at 18 (citing Ex. 1006 ¶¶ 33–34, 36, 57, 64, 76, Fig. 3). Thus, Qualcomm argues that “an association between Benson’s master unit . . . and a remote sensor is an association between that master unit and the remote sensor unit to which the remote sensor is attached.” *Id.*

FedEx disagrees that “remote sensors are *necessarily* attached to a remote sensor unit” because sensors “may be attached directly to a master

unit.” PO Sur-reply 20–21 (citing Ex. 1006 ¶¶ 49, 85–87). And FedEx points to language in Benson indicating that the remote *sensor* is authenticated, not the remote sensor *unit*. *Id.* at 21 (citing Ex. 1006 ¶ 49; Ex. 2200 ¶¶ 93–94).

We find Qualcomm’s argument persuasive. First, we agree with Qualcomm that a remote sensor is necessarily connected to a remote sensor unit, because otherwise it would not be a “remote” sensor. Although “sensors” may connect directly to a master unit, we find no passage in Benson referring to such sensors as “remote” sensors. *See, e.g.*, Ex. 1006 ¶ 49 (“empty slots in the master device can be filled with new sensors”), 85 (distinguishing between “a remote sensor” and “a sensor connected directly to the master unit”).

Second, we agree with Qualcomm that by associating a master unit with a remote *sensor*, this also necessarily associates the master unit with its corresponding remote sensor *unit*. *See* Ex. 1006 ¶ 65 (authenticating a remote sensor to a master unit requires “providing the master unit with the remote sensor unit’s digital ID/signature”). This creates a hierarchical sensor network that includes the master unit (the “mobile master node”) and the remote sensor unit (the “ID node”, to which remote sensors are attachments).

For all the above reasons, Qualcomm has shown that the combination of Lau and Benson teaches limitation 1.c.

(h) Conclusion as to Claim 1

For all reasons discussed in the sections above, we determine that Qualcomm has shown by a preponderance of the evidence that claim 1 is unpatentable as obvious over Lau in view of Benson.

5. *Independent Claim 10*

Independent claim 10 contains limitations similar to claim 1, except that it requires physically placing the mobile master node and ID nodes within packages comprising the grouped set of packages, providing power to the mobile master and ID nodes, and activating the hierarchical sensor network. Ex. 1001, 416:48–67.

Qualcomm relies primarily on its arguments for claim 1, additionally arguing that Benson discloses enabling master units and remote sensors with power. Pet. 47–49 (citing Ex. 1006 ¶¶ 46, 58; Ex. 1002 ¶ 108).

Apart from its arguments for independent claim 1, FedEx does not specifically contest Qualcomm’s arguments for claim 10. *See* PO Resp. 55.

Having reviewed Qualcomm’s arguments and FedEx’s arguments regarding claims 1 (*see supra* Section IV.C.4) and 10, we determine that Qualcomm has shown by a preponderance of the evidence that claim 10 is unpatentable as obvious over Lau in view of Benson.

6. *Independent Claim 16*

Independent claim 16 is a method claim generally similar to claim 1, but the ID node communicates with the mobile master node over a “short range communication path” and the mobile master node communicates with the server over a “longer range communication path.” Ex. 1001, 417:35–41; *compare id.* at 417:31–59, *with id.* at 415:61–416:14. Claim 16 also requires that the mobile master node transmit an authorization request to associate itself with an ID node, and receiving a response from the server. *Id.* at 417:50–55. Also, whereas claim 1 recites “associating, by the server, the master mobile node with one of the packages,” claim 16 recites “associating,

by the mobile master node, one of the packages . . . with the mobile master node.” Ex. 1001, 415:66–67, 417:35–37.

For the “transmitting” and “receiving” steps, Qualcomm points to teachings in Benson referring to messages transmitted between the master unit and the server in the course of associating the master unit with a remote sensor. Pet. 54–55.

FedEx argues that Qualcomm has not shown that the Lau–Benson combination teaches that the association between a master unit and a package is “by the mobile master node.” *See* PO Resp. 53–55. FedEx asserts that these limitations in claims 1 and 16 reflect different embodiments in the ’231 patent, and Qualcomm did not refer to the claim-16 embodiment in the Petition. *See id.* at 54–55 (citing Ex. 1001, 213:11–14, 213:42–45, 214:27–30, 214:47–59, 415:66–67, 417:35–37; Ex. 2200 ¶¶ 97–99).

Qualcomm contends that in Benson, the recited association corresponds in Benson with the attachment of the master unit to a particular package. Pet. Reply 20. According to Qualcomm, claim 16 does not require more than this because the ’231 patent discloses no other particular act, performed by the mobile master node but not the server, than simply being attached to a package. *Id.* at 19–20 (citing Ex. 1001, 3:26–51, 214:24–55, Fig. 62).

In its Sur-reply, FedEx argues that the ’231 patent discloses that an association between a mobile master node and a package “may occur through recording association data,” which the mobile master node itself may record. PO Sur-reply 22 (citing Ex. 1001, 27:58–65, 28:11–16, 198:2–5, 213:18–21, 214:27–30).

We agree with FedEx that that Qualcomm has not shown that the Lau–Benson combination teaches that the association between a master unit and a package is “by the mobile master node.” *See* PO Resp. 53–55. In the Petition, Qualcomm states “*See* Limitation [1.a.i]” for limitation 16.a.i, and does not provide further explanation for limitation 16.a.i. *Id.* Pet. 52 (brackets in original). Importantly, whereas claim 1 recites “associating, by the server, the master mobile node with one of the packages,” claim 16 recites “associating, by the mobile master node, one of the packages . . . with the mobile master node.” Ex. 1001, 415:66–67, 417:35–37.

In its Reply, Qualcomm argues that its “proof that master unit 105 is associated with object #1 in both the **First Arrangement** and the **Second Arrangement** as set forth in Limitation [1.a.1] does satisfy the disputed language of Limitation [16.a.1].” Pet. Reply 20 (brackets in original). Qualcomm also argues that, “[a]t a minimum, master unit’s attachment to object #1 in the **Second Arrangement** is the master unit 105 associating with object #1.” *Id.* We disagree. That a master unit is associated with object #1 or attached to object #1 does not teach “associating, *by the mobile master node*, one of the packages . . . with the mobile master node.” Ex. 1001, 417:35–37 (emphasis added). Indeed, with respect to limitation 1.a.i, although we determine that a person of ordinary skill in the art would have understood Benson to suggest that a master unit may, itself, be associated with a package to be tracked, our analysis and conclusion is based on Qualcomm’s arguments that the combination of Lau and Benson teach the different recitation, that is “associating, *by the server*, the master mobile node with one of the packages.” *See* Section IV.C.4(b).

In its Reply, Qualcomm also argues that prior art teachings are sufficient in view of the disclosure of the '231 patent. Pet. Reply 19–20. Qualcomm quotes the '231 patent's disclosure that “method 6200 begins at step 6205 with *the mobile master unit associating with one of the packages in the grouped set of packages with the mobile master node.*” *Id.* at 20 (citing Ex. 1001, 214:28–34) (emphasis added). We find that the '231 patent disclosure is consistent with the recitation in claim 16 of “associating, *by the mobile master node*, one of the packages . . . with the mobile master node.” Ex. 1001, 417:35–37 (emphasis added). We find that Qualcomm has not addressed that recitation in claim 16. Thus, we determine that Qualcomm has not shown by a preponderance of the evidence that claim 16 is unpatentable as obvious over Lau in view of Benson.

7. *Independent Claim 26*

Independent claim 26 is generally similar to claim 1 except that it recites “[a] hierarchical sensor system.” Ex. 1001, 418:30; *compare id.* at 418:31–55, *with id.* at 415:61–416:14. Also, unlike claim 1 but like independent claim 16, the ID node communicates with the mobile master node over a “short range communication path” and the mobile master node communicates with the server over a “longer range communication path.” Ex. 1001, 418:32–42; *compare id.* at 418:30–55, *with id.* at 415:61–416:14, *and id.* at 417:31–59. Another difference is that whereas claim 1 states that the ID node is “not operative to communicate directly with the server” (*id.* at 416:8–9), claim 26 states that the ID node is “unable to directly communicate with the server” (*id.* at 418:41–42).

The claim also includes the following limitation:

wherein the mobile master node is further operative to receive the collected shipment condition information from the ID nodes over the short range communication path and update the server over the longer range communication path with summary shipment condition information related to each of the packages in the set of packages, the summary shipment condition information being based upon the collected shipment condition information from the ID nodes.

Ex. 1001, 418:46–55.

(a) “Short Range Communication Path”

Qualcomm generally relies on its arguments for independent claims 1 and 16 and uncontested dependent claims 2, 6 and 7. Pet. 58–60; *see infra* Section IV.C.10. For the limitations requiring particular communication over a “short range communication path” and a “longer range communication path,” Qualcomm relies on its arguments for claim 16, which points to teachings in Benson about communication over a wireless LAN and a satellite relay, respectively. Pet. 52–53, 58–59.

First, FedEx argues that Qualcomm has failed to show that the Lau–Benson combination teaches or suggests that ID nodes are operative to communicate with the mobile master node “over a short range communication path.” PO Resp. 46–47. According to FedEx, Qualcomm relies on Benson’s disclosure of communication over wireless local area networks (WLANs), “[b]ut the ’231 specification explicitly describes WLAN as a medium-range communication, distinguishing it from the claimed ‘short range’ variety.” *Id.* (citing Ex. 1001, 11:53–59; Ex. 1006, Figs. 1A, 1B; Ex. 2200 ¶ 117).

Qualcomm replies that with respect to the claimed subject matter, the '231 patent only relevantly distinguishes between “short range” and “longer range” communication, which are relative terms, and “there is no dispute that a WLAN communication path is shorter than a satellite relay.” Pet. Reply 11 (citing Ex. 1001, 11:53–59). According to Qualcomm, the '231 patent gives WLANs as *an example* of “medium range wireless communication,” but does not define any of these terms. *Id.* at 12 (citing Ex. 1001, 11:47–59; Ex. 1022, 63:5–64:9). Qualcomm also argues that Dr. Almeroth conceded that “he ‘might have’ seen a WLAN communication referred to as a short-range communication in the field of art relevant to the '231 Patent,” that there is no dictionary definition identifying what types of communication are “short range,” and that the '231 patent does not explicitly define “short range communication.” *Id.* at 12–13 (citing Ex. 1022, 61:14–66:4, 66:5–68:19).

In its Sur-reply, FedEx asserts that “[m]edium-range communications are expressly omitted” from the claims of the '231 patent. PO Sur-reply 16 (citing Ex. 1001, 418:30–54). Nevertheless, FedEx contends that “WLAN falls more squarely within the longer-range communication between the master node and the server.” *Id.* at 17 (citing Ex. 1001, 11:55–59). And according to FedEx, “[w]hatever ‘short-range’ means in the abstract, the specification explicitly excludes ‘WLAN’ from its scope.” *Id.* (citing Ex. 1001, 11:53–59).

We agree with Qualcomm that the evidence does not suggest that the '231 patent has disclaimed what it calls “medium range wireless communication,” which would include a WLAN. *See* Ex. 1001, 11:47–59. Any such disclaimer would have to be clear and unambiguous, and FedEx

has not pointed to any such clear disclaimer in the '231 patent or its prosecution history. *See Epistar Corp. v. Int'l Trade Comm'n*, 566 F.3d 1321, 1335 (Fed. Cir. 2009). We also agree with Qualcomm that “short range communication” is not a term of art in the relevant field. *See* Pet. Reply 12–13; Ex. 1022, 61:14–66:4, 66:5–68:19. And finally, we disagree with FedEx that the '231 patent's examples of “short range communication” are definitional in such a way that it would categorically exclude other possible embodiments. *Helmsderfer v. Bobrick Washroom Equip., Inc.*, 527 F.3d 1379, 1381 (Fed. Cir. 2008) (“A patentee may act as its own lexicographer and assign to a term a unique definition that is different from its ordinary and customary meaning; however, a patentee must clearly express that intent in the written description.”).

There is also no credible evidence of an intent to exclude a WLAN as a way for sensor nodes to communicate with each other in the context of claim 26. In particular, because the '231 patent describes WLAN as a “medium range” technology, we find no manifest expression of intent to exclude WLAN or other “medium range” communications technologies as the recited “short range communication path,” so long as the “longer range communication path” is, in fact, “longer.”

Moreover, as Qualcomm noted in the Petition, Lau (via its provisional) already discloses the use of Bluetooth for communication between tracking objects and a nearby position-computing device, which in turn communicates separately with a remote site over a wide area or global network. *See* Pet. 19 (citing Ex. 1005, 51, 53). We determine that a person of ordinary skill in the art would have considered Benson's teachings in light of this similar embodiment in Lau, and understood that Bluetooth was an

option for communication between a master unit and remote sensor units in the Lau–Benson combination.

Thus, we determine that Qualcomm has shown that the Lau–Benson combination teaches this limitation of claim 26.

(b) “Unable to Directly Communicate with the Server”

For the “unable to directly communicate with the server” limitation, Qualcomm relies on its arguments for claim 1. Pet. 59. That argument is that having the remote sensing units in the Benson–Lau combination not operative to communicate directly with the server would have been obvious in light of Benson’s teachings that, in one embodiment, the remote sensor unit is not communicating with the central data collection server directly. Pet. 34–35 (citing Ex. 1006 ¶¶ 50, 85).

In its Response, FedEx’s argument relies on its proposed construction of the term “unable to directly communicate with the server.” *See* PO Resp. 40–44; *supra* Section IV.B.1. According to FedEx, Benson “does not teach a remote sensor physically incapable of communicating with the server.” *Id.* at 40–41 (citing Ex. 1006 ¶¶ 40, 50, 53; Ex. 2200 ¶ 103). Rather, FedEx argues that Benson teaches examples in which remote sensors communicate with a server via satellite. *Id.* at 41–42 (citing Ex. 1006 ¶ 36, Fig. 1A; Ex. 2200 ¶¶ 103–104)

As we discuss above, we do not agree with FedEx’s proposed construction of “unable to directly communicate with the server.” *See supra* Section IV.B.1. To the extent that Benson discloses remote sensor units communicating with the server via satellite, these appear to be particular embodiments, but Benson clearly discloses an embodiment in which the

remote sensor unit is “not communicating with the central data collection server directly.” Ex. 1006 ¶ 50; *see also supra* Section IV.C.4(f).

For the above reasons, we determine that Qualcomm has shown that in the Lau–Benson combination, a person of ordinary skill in the art would have had reason not to enable its hardware, if any, for communicating directly with the server.

(c) “Summary Shipment Condition Information”

For the limitation requiring “summary shipment condition information,” Qualcomm argues that, based on its proposed interpretation of that phrase (*see supra* Section IV.B.2), Benson teaches the limitation by providing a data packet with fields including data samples from various sensors, and it constitutes “a compilation of data sensed from each package.” Pet. 60 (citing Ex. 1006 ¶¶ 78, 81; Ex. 1002 ¶ 144).

FedEx’s argument for this limitation relies on its proposed construction of the term “summary shipment condition information,” but we disagree with that proposed construction. *See* PO Resp. 44–45 (citing Ex. 2200 ¶ 112). According to the ’231 patent specification, “summary shipment condition information” must include at least “a compilation of environmental and location information collected related to packages in the set of packages.” Ex. 1001, 216:41–44; *supra* Section IV.B.2.

Based on the evidence of record, we determine that Qualcomm shows, by a preponderance of the evidence, that Benson teaches providing a compilation of environmental and location information collected related to packages in the set of packages. *See* Ex. 1006 ¶¶ 78, 81, Fig. 7. Thus, we determine that Qualcomm has shown that the Lau–Benson combination teaches this limitation of claim 26.

For all the reasons in the preceding sections, and our discussions above about claims 1 and 16, we determine that Qualcomm has shown by a preponderance of the evidence that claim 26 is unpatentable as obvious over either Lau in view of Benson. *See supra* Sections IV.C.4, 6.

8. *Dependent Claim 9*

Claim 9 depends from independent claim 1 and further recites the following:

managing, by the server, power consumption of the hierarchical sensor network by transmitting a power management instruction to the master node by the server, the power management instruction causing the mobile master node to alter at least one operation of the mobile master node and the ID node to change power consumption by at least one of the mobile master node and the ID node.

Ex. 1001, 416:40–47.

As the recited “power management instruction,” Qualcomm identifies either or both of Benson’s “activation request” and “task assignment script.” Pet. 41 (citing Ex. 1002 ¶ 95). Qualcomm argues that Benson’s master unit exits its hibernation state and becomes active when it receives an “activation request.” Pet. 41–42 (citing Ex. 1006 ¶¶ 17, 60, Fig. 4; Ex. 1002 ¶ 95). And while active, it receives a “task assignment script,” which is a list of “monitoring tasks to be performed utilizing preferably two remote sensors.” Pet. 43 (quoting Ex. 1006 ¶ 84) (citing Ex. 1006 ¶ 63, Fig. 8; Ex. 1002 ¶ 95). According to Qualcomm, this includes setting “sample and transmit interval times,” which “refer to how frequently the remote sensors sample data and transmit that data back to the master unit.” Pet. 43 (citing Ex. 1006 ¶ 64; Ex. 1002 ¶ 97). Qualcomm argues that these are sent to the remote sensors. Pet. 43–45 & n.4 (citing Ex. 1006 ¶¶ 63–66, Fig. 5; Ex. 1002 ¶ 97 & n.1).

According to Qualcomm, a person of ordinary skill in the art would have understood “that an activation request and a message specifying the sample and transmit interval times is a power management instruction because the interval between samples and wireless communication transmit rate has a direct impact on power consumption.” Pet. 45 (citing Ex. 1002 ¶ 98); *see also* Pet. 46–47 (citing Ex. 1014 (“SiLabs document”¹⁰), 1, 4, 6; Ex. 1002 ¶¶ 99–101).

FedEx argues that a single “power management instruction” must cause the mobile master node to alter at least one operation of *both* the mobile master node and the ID node, and that Qualcomm has not shown that either one of its two alleged instructions has that effect. PO Resp. 58–59 (citing Ex. 1001, 416:43–47; Ex. 1006 ¶ 60, Fig. 4; Ex. 2200 ¶¶ 123–125).

Regarding Benson’s “activation request,” FedEx argues that Qualcomm failed to show how Benson’s activation request *causes* the master unit to exit a hibernation state. PO Resp. 56–57 (citing Ex. 2200 ¶¶ 119–122). According to FedEx, Benson’s “activation request” appears only in Figure 4 and there is “no indication that this activation request causes

¹⁰ Silicon Laboratories (SiLabs), *Optimizing Current Consumption in Bluetooth Low Energy Devices* <https://docs.silabs.com/bluetooth/2.13/general/system-and-performance/optimizing-current-consumption-in-bluetooth-low-energy-devices> (Ex. 1014). This is one of the documents challenged in FedEx’s Motion to Exclude. *See supra* Section III. We need not, and do not, consider this exhibit in our analysis. We do, however, credit Dr. Kotzin’s testimony on the overall issue (and Dr. Almeroth’s rebuttal testimony, Ex. 2200 ¶ 129–131), even though it cites the SiLabs document, and we note that the admissibility of this testimony has not been challenged. *See* Ex. 1002 ¶ 101; Paper 65, 4 (Qualcomm noting that FedEx “has not moved to exclude paragraph 101 of Dr. Kotzin’s declaration”); Paper 66 (FedEx acknowledging that “an expert may rely on inadmissible facts”).

the master unit to exit a hibernation state.” *Id.* at 57. Rather, FedEx asserts that the master unit continuously, periodically, or randomly transfers out of the hibernation state of its own accord to monitor for incoming instructions. *Id.* at 57–58 (citing Ex. 1006 ¶ 60, Fig. 4; Ex. 1013, 9:29–36; Ex. 2200 ¶ 121).

Although the information in Benson about the activation request is scant, its name and its depiction in Figure 4 appear to indicate that its purpose is to request activation by the master unit, and in light of this, we find Dr. Kotzin’s argument that the request is what wakes the master unit from its hibernation state is more credible than Dr. Almeroth’s testimony that the master unit wakes on its own volition. Ex. 1002 ¶ 95; Ex. 2200 ¶ 120–122; Ex. 1022, 144:2–150:8.

Regarding Benson’s “task assignment script,” FedEx contends that Qualcomm has failed to show that power consumption *necessarily* would be changed as a result of this script. *Id.* at 61–62 (citing Ex. 1014, 1; Ex. 2200 ¶ 131).

We find credible Dr. Kotzin’s testimony that a person of ordinary skill in the art at the time of the claimed invention would have considered Benson’s teaching of a task altering sample and transmit interval times to be a “power management instruction” that “change[s] power consumption.” Ex. 1006 ¶¶ 99–100. We find this more credible than Dr. Almeroth’s testimony to the contrary. Ex. 2200 ¶¶ 128–132. It appears more likely than not, based on the evidence of record, that an ordinarily skilled artisan in the field would have understood these timing parameters as bearing a direct relation to power consumption, and thus would necessarily be expected to “change power consumption.”

9. *Dependent Claims 2–8, 11–15, 17–25, 27, and 29–30*

Claims 2–8 depend directly or indirectly from claim 1, claims 11–15 depend from claim 10, claims 17–25 depend directly or indirectly from claim 16, and claims 27 and 29–30 depend from claim 26. See Ex. 1001, 416:15–39, 417:1–30, 417:60–418:29, 418:56–59, 418:65–419:3.

Qualcomm provides detailed explanations as to how the combined teachings of Lau and Benson teach or suggest each of the limitations in these claims and why it would have been obvious to combine those teachings with a reasonable expectation of success, citing supporting testimony by Dr. Kotzin. See Pet. 36–41, 49–51, 55–58, 61–62. Apart from its general arguments directed to claims 1, 9, 10, 16, and 26, FedEx does not specifically contest Qualcomm’s arguments for these claims. See PO Resp. 63.

Having reviewed Qualcomm’s arguments and FedEx’s arguments regarding these claims and the independent claims from which they depend, which we discuss above (*see supra* Sections IV.C.4–6), we determine that Qualcomm has shown by a preponderance of the evidence that claims 2–8, 11–15, 27, and 29–30 are unpatentable as obvious over Lau in view of Benson. Because of our determination as to independent claim 16, Qualcomm has not shown, by a preponderance of the evidence, that dependent claims 17–25 are unpatentable. See *supra* Section IV.C.6.

10. *Dependent Claim 28 (Ground Based on Lau, Benson, and Haring)*

Claim 28 depends from independent claim 26 and further recites “wherein the set of packages comprise a group of packages identified by shipping information to be related and shipped together, the shipping

information maintained on the server and defined by a shipping customer.”
Ex. 1001, 418:60–64.

In its second ground, Qualcomm argues that claim 28 would have been obvious based on the combination of Lau, Benson, and Harring. Pet. 62–69. Qualcomm relies primarily on its arguments for claim 26 and further incorporates teachings of Harring about a cargo traffic and monitoring system that provides data about groups of packages that are shipping together, asserting that a person of ordinary skill in the art would have reason to combine those teachings with the Lau–Benson combination as discussed above. *See* Pet. 62–69.

FedEx does not specifically dispute this ground apart from its arguments about independent claim 26. *See* PO Resp. 63–64. Having considered the evidence, we determine that Qualcomm has shown by a preponderance of the evidence that claim 28 is unpatentable under 35 U.S.C. § 103 as obvious over the combination of Lau, Benson, and Harring.

V. CONCLUSION¹¹

For the reasons above, Qualcomm has shown by a preponderance of the evidence that claims 1–15, 26–30 of the ’231 patent are unpatentable

¹¹ Should FedEx wish to pursue amendment of claims in a reissue or reexamination proceeding after this decision, we draw attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. *See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If FedEx chooses to file a reissue application or a request for reexamination of the challenged patent, we remind FedEx of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

under § 103 as obvious over Lau in view of Benson (claims 1–15, 26, 27, 29, and 30) or over Lau in view of Benson and Harring (claim 28). Qualcomm has not shown, by a preponderance of the evidence, that claims 16–25 are unpatentable.

VI. ORDER

In consideration of the foregoing, it is

ORDERED that claims 1–15 and 26–30 of the '231 patent are unpatentable;

FURTHER ORDERED that Qualcomm has not shown, by a preponderance of the evidence, that claims 16–25 are unpatentable;

FURTHER ORDERED that with respect to Patent Owner's Motion to Exclude, the pending requests to exclude Exhibits 1010, 1014, 1026, and 1027 are *dismissed* as moot; and

FURTHER ORDERED that 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.

In summary:

Claim(s)	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–27, 29, 30	103	Lau, Benson	1–15, 26, 27, 29, 30	16–25
28	103	Lau, Benson, Harring	28	
Overall Outcome			1–15, 26–30	16–25

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