

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TCT MOBILE, INC. AND TCT MOBILE (US) INC.,
Petitioner,

v.

WIRELESS PROTOCOL INNOVATIONS, INC.,
Patent Owner.

Case IPR2016-01494
Patent 8,274,991 B2

Before KEVIN F. TURNER, MITCHELL G. WEATHERLY, and
KAMRAN JIVANI, *Administrative Patent Judges*.

WEATHERLY, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. BACKGROUND

TCT Mobile, Inc. and TCT Mobile (US) Inc. (collectively “TCT”) filed a petition (Paper 2, “Pet.”) to institute an *inter partes* review of claims 1 and 3–5 (the “challenged claims”) of U.S. Patent No. 8,274,991 B2 (Ex. 1001, “the ’991 patent”). 35 U.S.C. § 311. TCT supported the Petition with evidence including the declaration of Stuart J. Lipoff (Ex. 1005).

Wireless Protocol Innovations, Inc. (“WPI”) timely filed a Preliminary Response. Paper 7 (“Prelim. Resp.”). WPI supported its Preliminary Response with evidence including the declaration of Gary Lomp, Ph.D. (Ex. 2001). On February 13, 2017, based on the record before us at the time, we instituted an *inter partes* review of claims 1 and 3–5. Paper 8 (“Institution Decision” or “Dec.”); *see also* Paper 10, 3 (correcting errors identifying claims and challenges for which *inter partes* review was instituted). We instituted the review on the following challenges to the claims:

References	Basis	Claims challenged
International Patent Publication No. WO 99/61993, published Dec. 2, 1999 (Ex. 1022, “Abi-Nassif”) and Data-Over-Cable Service Interface Specifications, ¹ Radio Frequency Interface Specification, Second Interim Release, Document Control No. SP-RFIV1.1-I02-990731 (1999) (Ex. 1019, “DOCSIS 1.1”)	§ 103	1 and 3–5
U.S. Patent No. 6,466,544 B1, issued Oct. 15, 2002 (Ex. 1023, “Sen”), Alleged Admitted Prior Art (“APA”), and U.S. Patent No. 6,665,307 B1, issued Dec. 16, 2003 (Ex. 1024, “Rydneil”)	§ 103	1 and 3–5

After we instituted this review, Patent Owner filed a Patent Owner Response in opposition to the Petition (Paper 20, “PO Resp.”) that was supported by a Second Declaration from Gary Lomp, Ph.D. (Ex. 2004). Petitioner filed a corrected Reply in support of the Petition (Paper 28,

¹ We refer to the first version of the Data-Over-Cable Service Interface Specifications as “DOCSIS.”

“Reply”). Patent Owner did not move to amend any claim of the ’991 patent.

We heard oral argument on December 7, 2017. A transcript of the argument has been entered in the record (Paper 35, “Tr.”).

We have jurisdiction under 35 U.S.C. § 6(c). The evidentiary standard is a preponderance of the evidence. *See* 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons expressed below, we conclude that Petitioner has demonstrated by a preponderance of evidence that claims 1 and 3–5 are unpatentable.

B. RELATED PROCEEDINGS

TCT and WPI identified as related proceedings the co-pending district court proceedings of *Wireless Protocol Innovations, Inc. v. TCL Corporation, et al.*, Case Number 6:15-cv-918 (E.D. Tex.) and *Wireless Protocol Innovations, Inc. v. ZTE Corporation, et al.*, Case Number 6:15-cv-919 (E.D. Tex.). Pet. 2; Paper 5, 2. TCT also identified as related proceedings the following closed district court proceedings: *WI-LAN Inc., et al. v. Research In Motion Limited et al.*, Case No. 3:13-cv-2431 (N.D. Tex.) and *Wi-LAN Inc., et al. v. Research In Motion Limited et al.*, Case No. 1:13-cv-21662 (S.D. Fla.). Pet. 2–3; Paper 5, 3. WPI identified three issued U.S. Patents and one pending U.S. Patent Application as being related to the ’991 patent including: U.S. Patent Nos. 8,565,256 B2; 9,125,051 B2; and 9,154,961 B2 and U.S. Application No. 14/805,051. Paper 5, 3–4. Although not identified by either party, U.S. Patent No. 8,565,256 B2 is the subject of a petition for *inter partes* review filed by TCT in IPR2016-01704,

and U.S. Patent No. 9,125,051 B2 is the subject of petitions for *inter partes* review filed by TCT in IPR2016-01861 and IPR2016-01865.

C. THE '991 PATENT

The '991 patent relates to “point-to-multipoint communication; in particular, the invention relates to control of contention for data slots by customer premises equipment in a wireless point-to-multipoint communication system.” Ex. 1001, 1:27–29. “Contention” is shorthand for the process by which many instances of customer provided equipment (one being a “CPE”) negotiate for assignment of data slots available from a base station controller (“BSC”). *Id.* at 1:31–42. The Specification identifies problems with conventional methods when two CPEs “collide” while requesting a data slot, especially when the traffic from the CPEs is not “bursty” (e.g., traffic generated by online games and voice sources). *Id.* at 1:43–2:6. To address such problems, the Specification suggests a system of “using a new state machine to control contention” that “includes a grant pending absent state in which the [CPE] is polled with a unicast request slot.” *Id.* at 2:10–18. The Specification briefly describes the grant pending absent state as follows:

By virtue of the grant pending absent state, the customer premises equipment can request a data slot without entering into contention and generating excess contention traffic. After a suitable delay without more data being received to send upstream, the state machine can exit the grant pending absent state. This delay preferably is long enough for receipt of new non-bursty data for a communication, for example 50 ms.

Id. at 2:23–29. When in the grant pending absent state, the CPE need not have data to send upstream but, once the CPE does have data to send, it can use the non-contention unicast request slot to send that data rather than

having to negotiate for a new data slot using contention. *Id.* at 2:66–3:3. When in a grant pending state, the CPE can hold its granted data slot by using “piggybacking to request grant of a next data slot while sending upstream data to BSC.” *Id.* at 7:17–19. Thus, the CPE can seek bandwidth for transmitting data using the following three ways: (1) sending a contention request while the CPE is idle or deferring, (2) responding to unicast polling during a specified period of time after the CPE finishes sending data within a slot obtained via contention, and (3) piggybacking while the CPE is sending data within a slot obtained via contention.

Of the challenged claims, only claim 1 is independent, and dependent claims 3–5 ultimately depend from claim 1. *Id.* at 11:39–12:40. Claim 1 is directed to a “method for obtaining uplink (UL) transmission bandwidth” and recites:

1. A method for obtaining uplink (UL) transmission bandwidth in a point-to-multipoint communication system, where a customer premises equipment (CPE) is communicating with a base station controller (BSC) over a link shared with other CPEs, comprising the steps of:

operating the CPE in a grant pending state wherein the CPE awaits receipt of a bandwidth grant from the BSC, receives the bandwidth grant, transmits data to the BSC using the granted bandwidth, transmits further bandwidth requests using the granted bandwidth and transitioning from the grant pending state to a grant pending absent state once

the CPE has transmitted upstream data to the BSC within a bandwidth specified by the bandwidth grant received from the BSC during the grant pending state and

the CPE has no pending bandwidth requests;

operating the CPE in the grant pending absent state awaiting arrival of data for transmission to the BSC and transmitting a first type bandwidth request to the BSC

without entering into contention when the CPE receives data for transmission;

transitioning operation of the CPE from the grant pending absent state to the grant pending state after a subsequent bandwidth grant is received at the CPE; and

transitioning operation of the CPE from the grant pending absent state to an idle state if the CPE does not transmit any first type bandwidth request to the BSC during a timeout period.

Id. at 11:39–2:26.

The “first type bandwidth request” recited above corresponds to the CPE responding to a unicast polling request from the BSC with an indication that the CPE has data to send. The Specification describes this type of bandwidth request as follows:

During grant pending absent state 23, CPE 13 sends no upstream data to BSC 12. No grant is pending because piggybacking was not used in the previous transmission of data to BSC 12 (hence the name of the state). Rather, *CPE 13 is periodically (e.g., every 10 ms) polled by BSC 12 with a unicast request slot. CPE 13 can use this unicast request slot to request a data slot for sending upstream data to the base station controller.* Thus, if more data is received by . . . CPE 13 to send upstream to BSC 12, CPE 13 can request a data slot without going through contention, thereby reducing contention traffic.

Id. at 7:24–35.

Claim 3, which depends directly from claim 1, recites a method in which “the CPE is further operated in a deferring state in which the CPE determines when to transmit a second type bandwidth request.” *Id.* at 12:31–33. The “second type bandwidth request” refers to a contention-based request for bandwidth (i.e., a “REQ message”). *Id.* at 6:57–7:9.

Claim 5, which depends directly from claim 1, recites a method in which “in the grant pending state, the CPE transmits a third type bandwidth request in the bandwidth allocated to the CPE for transmitting upstream data.” *Id.* at 12:37–40. The “third type bandwidth request” refers to a piggybacking type request. *Id.* at 7:17–19.

II. ANALYSIS

A. CLAIM INTERPRETATION

“A claim in an unexpired patent shall be given its broadest reasonable construction in light of the specification of the patent in which it appears.” 37 C.F.R. § 42.100(b); *see also* *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142 (2016) (affirming that USPTO has statutory authority to construe claims according to Rule 42.100(b)). When applying that standard, we interpret the claim language as it would be understood by one of ordinary skill in the art in light of the specification, and absent any special definition, we give claim terms their ordinary and customary meaning. *See In re Suitco Surface, Inc.*, 603 F.3d 1255, 1260 (Fed. Cir. 2010); *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007) (“The ordinary and customary meaning is the meaning that the term would have to a person of ordinary skill in the art in question.” (internal quotation marks and citation omitted)). Only terms which are in controversy need to be construed, and then only to the extent necessary to resolve the controversy. *See Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

We instructed the parties to address expressly during the trial the meaning of the following phrases in claim 1:

- (1) “transmitting a first type bandwidth request . . . when the CPE receives data for transmission” with “particular focus on the word ‘when’,” Dec. 11;
- (2) “transitioning operation . . . after a subsequent bandwidth grant is received at the CPE” with “particular focus on the word ‘after’,” *id.* at 13; and
- (3) “if the CPE does not transmit any first type bandwidth request to the BSC during a timeout period,” *id.* at 15.

We address each term below.

1. transmitting a first type bandwidth request . . . when the CPE receives data for transmission

WPI argues that “when” as used in this phrase means “in the event that.” PO Resp. 10–11. TCT contends that “when” means “upon or after which.” Reply 4. TCT cites only testimony by Dr. Lomp on cross examination, which fails to support its argument that the Specification provides no reason to interpret “when” as it proposes. *See* Ex. 1043, 14:2–15:25 (Dr. Lomp disagreeing with TCT’s proposed interpretation of “when” as being too ambiguous). WPI’s arguments, which are based on usage of “when” in the Specification, Ex. 5:55–58, and prosecution history, Ex. 2007, 7, are persuasive.

Accordingly, we interpret “when the CPE receives data for transmission” as meaning “in the event that the CPE receives data for transmission.” However, we do not consider the phrase to require that the CPE transmit the “first type bandwidth request” immediately upon receiving data to transfer without any intervening act. Instead, receiving data for

transmission is merely a condition precedent for “transmitting a first type bandwidth request.”

2. *transitioning operation . . . after a subsequent bandwidth grant is received at the CPE*

The entire phrase at issue within the relevant context recites:

“transitioning operation of the CPE from the grant pending absent state to the grant pending state after a subsequent bandwidth grant is received at the CPE.” Ex. 1001, 12:20–22.

WPI argues that “after” as used in this phrase means “subsequent to and in consequence of.” PO Resp. 12–13. WPI cites selected definitions from two lay dictionaries without any apparent reason for selecting the specific definition from among numerous definitions listed. See PO Resp. 12 (selecting one of sixteen definitions of “after” in Ex. 2005 and selecting one of eight definitions of “after” in Ex. 2006). WPI also cites the Specification’s description of the transition from grant pending absent state to grant pending state illustrated in Figure 2 as supporting its proposed interpretation. That portion of the Specification states: “[u]pon grant of a data slot for sending new data to BSC 12, CPE 13 returns [from grant pending absent state 23] to grant pending state 22.” Ex. 1001, 7:40–41. WPI also cites evidence from the prosecution history, which we find to be unpersuasive because it address the Applicant’s use of “after” in its argument relating to a different claim limitation. See Ex. 2008, 7–8 (presenting argument regarding *entering* the grant pending absent state rather than *leaving* the grant pending absent state).

TCT disagrees and argues that “after” means “subsequent to” without requiring a direct causal relationship between the recited “transitioning” and “bandwidth grant.” Reply 5. TCT relies upon the following portion of the

Specification: “The state machine preferably enters the grant pending absent state after the customer premises equipment has sent upstream data.”

Reply 5 (quoting Ex. 1001, 2:54–57). TCT argues that this usage of “after” does not imply a causal link between entering the grant pending absent state and the CPE sending upstream data, but merely that the former preferably happens, if at all, later in time than the latter. We find this portion of the Specification to provide little if any guidance on the meaning of “after” as used in the phrase at issue because the Specification is addressing a different aspect of the claimed method. TCT also cites testimony from Dr. Lomp in which he opines that “after” as used in the claim has “no immediacy.”

Reply 5 (citing Ex. 1043, 16:16–17:21). As explained below, we agree that “after” is not limited to requiring immediately transitioning operation from the grant pending absent state to grant pending state upon receiving a bandwidth grant. However, Dr. Lomp’s testimony does not support TCT’s proposed interpretation of “after” and simply meaning “subsequent to” without any causal relationship whatsoever.

We are persuaded by WPI’s argument, primarily because the Specification describes the transition from the grant pending absent state to the grant pending state as occurring “upon grant of a data slot.” Ex. 1001, 7:40–41. Accordingly, we interpret “after a subsequent bandwidth grant is received at the CPE” as meaning that the claimed “transitioning” occurs “subsequent to and in consequence of a subsequent bandwidth grant.” However, we do not consider the phrase to require “transitioning” immediately upon receiving the bandwidth grant without any intervening act. Instead, the “bandwidth grant” is merely a condition precedent for “transitioning operation.”

3. *if the CPE does not transmit any first type bandwidth request to the BSC during a timeout period*

The parties agree that “if” as used in this phrase means “on condition that” and proffers no express interpretation of the remainder of this phrase. PO Resp. 13–14; Reply 5–6. We interpret “if” to mean “on condition that” because it is consistent with the use of “if” in the Specification. *See, e.g.*, Ex. 1001, 2:50–54.

B. THE PARTIES’ POST-INSTITUTION ARGUMENTS

In our Institution Decision, we concluded that the argument and evidence adduced by TCT demonstrated a reasonable likelihood that claims 1 and 3–5 were unpatentable as obvious based on the challenges identified in the table in Part I.A above. Dec. 23–24. We must now determine whether Petitioner has established by a preponderance of the evidence that the specified claims are unpatentable over the cited prior art. 35 U.S.C. § 316(e). In this connection, we previously instructed Patent Owner that “any arguments for patentability not raised in the [Patent Owner Response] will be deemed waived.” Paper 9, 6; *see also In re Nuvasive, Inc.*, 842 F.3d 1376, 1381 (Fed. Cir. 2016) (holding that patent owner’s failure to proffer argument at trial as instructed in scheduling order constitutes waiver). Additionally, the Board’s Trial Practice Guide states that the Patent Owner Response “should identify all the involved claims that are believed to be patentable and state the basis for that belief.” Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,766 (Aug. 14, 2012).

C. LEGAL STANDARDS OF OBVIOUSNESS

TCT challenges the patentability of claims 1 and 3–5 on the grounds that the claims are obvious in light of various references including: Abi-

Nassif, DOCSIS 1.1, Sen, and Rydnell. To prevail in its challenges to the patentability of the claims, TCT must establish facts supporting its challenges by a preponderance of the evidence. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). “In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden never shifts to WPI. See *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (citing *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1326–27 (Fed. Cir. 2008)) (discussing the burden of proof in *inter partes* review).

The Supreme Court in *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398 (2007), reaffirmed the framework for determining obviousness as set forth in *Graham v. John Deere Co.*, 383 U.S. 1 (1966). The KSR Court summarized the four factual inquiries set forth in *Graham* that we apply in determining whether a claim is reasonably likely to be unpatentable as obvious under 35 U.S.C. § 103(a) as follows: (1) determining the scope and content of the prior art, (2) ascertaining the differences between the prior art and the claims at issue, (3) resolving the level of ordinary skill in the pertinent art,² and (4) considering objective evidence indicating obviousness

² The parties do not dispute that a person having ordinary skill in the art refers to a person holding an undergraduate degree in electrical engineering or having an equivalent educational experience, and three or more years working in a relevant field employing digital communications technology to deliver telecommunication services, or alternatively a relevant field

or nonobviousness. *KSR*, 550 U.S. at 406 (citing *Graham*, 383 U.S. at 17–18). In an *inter partes* review, Petitioner cannot satisfy its burden of proving obviousness by employing “mere conclusory statements.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016). Thus, to prevail Petitioner must explain how the proposed combinations of prior art would have rendered the challenged claims unpatentable. With these standards in mind, we address each challenge below.

D. OBVIOUSNESS IN VIEW OF ABI-NASSIF AND DOCSIS 1.1

TCT argues that the combination of Abi-Nassif and DOCSIS 1.1 renders claims 1 and 3–5 unpatentable as obvious. Pet. 40–61. TCT frames its challenge based on this combination by analyzing it two ways, one with Abi-Nassif being modified by teachings in DOCSIS 1.1, *id.* at 40–50, and another with DOCSIS 1.1 being modified by teachings in Abi-Nassif, *id.* at 50–61. We consider the pair of these separately identified challenges as if TCT had merely cast its challenge as being based on Abi-Nassif and DOCSIS 1.1 considered together.³ For the reasons expressed below, we are persuaded that TCT has established by a preponderance of evidence that the

involving the design of telecommunication products. Pet. 5 (citing Ex. 1005 ¶ 32); PO Resp. 6.

³ Our reviewing court has previously found that:

In a case of this type where a rejection is predicated on two references each containing pertinent disclosure which has been pointed out to the applicant, we deem it to be of no significance, but merely a matter of exposition, that the rejection is stated to be on A in view of B instead of on B in view of A, or to term one reference primary and the other secondary.

In re Bush, 296 F.2d 491, 496 (CCPA 1961).

combined teachings of Abi-Nassif and DOCSIS 1.1 render claims 1 and 3–5 obvious.

1. Overview of Abi-Nassif

TCT contends that Abi-Nassif “discloses every limitation of the ’991 Patent claims other than the trivial aspect of transitioning to an idle state based on a ‘timeout period.’” Pet. 23. Abi-Nassif describes a medium access control (“MAC”) protocol for coordinating access to a shared medium communication network such as data-over-cable using hybrid fiber-optic and coaxial cable. Ex. 1022, 1:6–9, 17:23–33. The MAC protocol provides rules for resolving collisions among secondary stations 104 as they request access to upstream channel 107. *Id.* at 18:19–19:9. The secondary stations can access the network using contention-free and contention-based methods. *Id.* at 19:10–20:20. Abi-Nassif refers to the operating states of its network as ACTIVE,

INACTIVE, and CONTENTION and describes an ability for secondary station 104 to transition from INACTIVE to ACTIVE without entering into contention. *Id.* at 22:30–24:4, Fig. 9. Abi-Nassif’s Figure 9, reproduced at right, is a state diagram reflecting these three states.

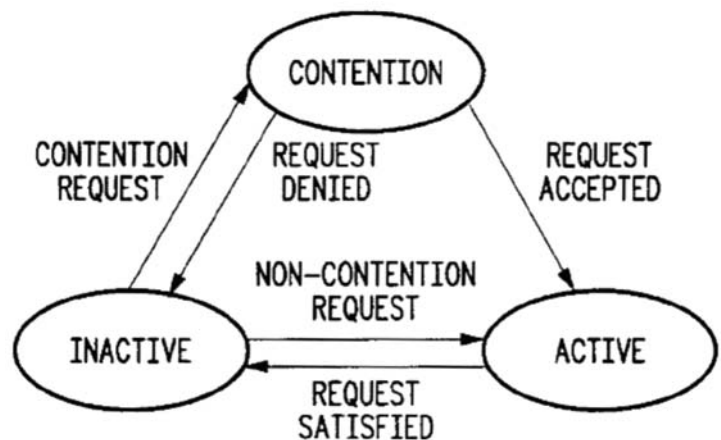


FIG. 9

A MAC user is in the INACTIVE state “so long as it has no data to transmit or it is waiting for an opportunity to transmit a request.” *Id.*

at 22:30–23:1. When the MAC user has data to transmit, it can transition into the ACTIVE state and transmit data upstream in one of two ways. *Id.* at 23:1–21. In one example, the MAC user transitions to the CONTENTION state and then the ACTIVE state using contention-based request for bandwidth is granted. *Id.* at 23:7–11. *See id.*, Figure 9 (INACTIVE to CONTENTION via “CONTENTION REQUEST” and then to ACTIVE via “REQUEST ACCEPTED”). In the other example, the MAC user transitions from INACTIVE directly to ACTIVE after “receiving a contention-free opportunity to transmit a request . . . as in the case of unicast polling.” *See id.* (INACTIVE to ACTIVE via “NON-CONTENTION REQUEST”). Thus, Abi-Nassif describes two different types of INACTIVE states. In the first INACTIVE state, the MAC user must use a contention request to secure a communication channel. In the second INACTIVE state, the MAC user can secure a channel using responses to unicast polling, a type of non-contention request. Abi-Nassif does not expressly describe, however, how it transitions between the first and second INACTIVE states.

Although the preferred embodiment of Abi-Nassif is a wired network, Abi-Nassif also suggests that its methods may be used over a wireless network. *Id.* at 17:32–18:2.

2. Overview of DOCSIS 1.1

TCT contends that DOCSIS 1.1 “describes every limitation claimed by the ’991 Patent in a manner nearly identical (albeit using different terminology) to the patent’s described embodiments.” Pet. 27. DOCSIS 1.1 is a complex and detailed standard by which cable providers deliver internet services to subscribers. *See generally* Ex. 1019. It specifies interactions

among various hardware in the network, which is schematically depicted at a high level in Figure 1-1 that is reproduced below.

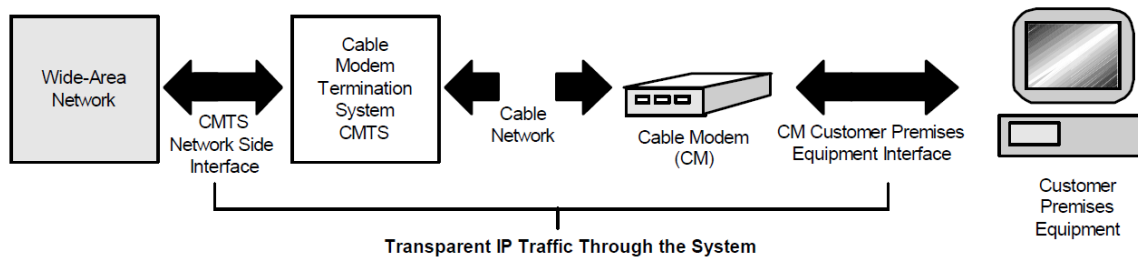


Figure 1-1 illustrates IP traffic over a “Data-Over-Cable” system. Figure 1-1 illustrates the communication pathway from customer premises equipment to cable modems (“CM”), which relay data traffic over the cable network to a “cable modem termination system” (“CMTS”) located at the provider’s end. Ex. 1019 § 1.3.1. DOCSIS 1.1 uses a time division multiple access (“TDMA”) method for the CM to transmit data upstream in which the CMTS manages usage of time slots by CMs via a MAC protocol similar to the one discussed in *Abi-Nassif*. *Id.* §§ 3.5.2, 7.1. In operation, the CMTS regularly broadcasts a Bandwidth Allocation Map (“MAP”) message, which allocates upstream transmission opportunities (i.e., bandwidth) among the various CMs. *Id.* §§ 6.3.4, 7.1.1 *et seq.*, Appendix O (“Bandwidth Allocation Map”); Ex.1005 ¶¶ 146–47.

The CMTS may broadcast an interval for requesting bandwidth, which the CMs interpret as an invitation to contend for bandwidth by sending requests during that interval. *Id.* § 7.1.2.1, § 7.1.3. Alternatively, the CMTS may unicast an interval to a specific CM, which allows a specific CM to request a data slot without contending with other CMs. *Id.* DOCSIS 1.1 also offered enhanced quality of service (“QoS”), when compared to DOCSIS 1.0, in which certain types of data (e.g., voice over IP,

high bandwidth FTP) that required high levels of network performance (e.g., high bandwidth, low latency, low jitter) are prioritized. *Id.* §§ 8.1.1.2, 8.1.6.

DOCSIS 1.1 describes the use of two “service flows” that use unicast polling to prioritize certain types of upstream data transmission. One, the real-time polling service (“rtPS”) enables the CM to reserve upstream data slots for real-time traffic like voice over IP (“VoIP”) while avoiding having to contend for those slots. *Id.* § 8.2.2, C.2.2.6.4; Ex. 1005 ¶ 163. The polling interval for the rtPS is on the order of tens of milliseconds or less. Ex. 1019 § 8.2.2. Another, the non-real-time polling service (“nrtPS”), reserves upstream data slots for applications like high bandwidth FTP transfers. *Id.* § 8.2.4. Like the rtPS, the nrtPS also allows the CM to reserve data slots without resorting to contention. *Id.*; Ex. 1005 ¶¶ 164–66.

3. TCT’s Argument and Evidence

TCT contends that Abi-Nassif describes every element recited in claim 1 other than the final step of transitioning from a grant pending absent state to an idle state based on a “timeout period.” Pet. 23, 40–49. TCT identifies the operation of the rtPS or nrtPS service flows from DOCSIS 1.1, which are unicast polling services that each terminate for non-use after a timeout period expires, as constituting this final step. *Id.* at 44–49. TCT argues that, based on the combined teachings of Abi-Nassif and DOCSIS 1.1, an ordinarily skilled artisan would have found it obvious to implement the timeout period that governs when the state of the CPE changes from a grant pending absent state to an idle state. *Id.* at 47 (citing Ex. 1005 ¶¶ 238, 252). TCT argues that because Abi-Nassif expressly incorporates DOCSIS 1.0, an ordinarily skilled artisan would have found it obvious to incorporate the revised DOCSIS 1.1 and its improvements into

Abi-Nassif to increase the efficiency of Abi-Nassif's use of bandwidth. *Id.* at 48–49 (citing Ex. 1005 ¶¶ 246–50).

4. Analysis of WPI's Counter Arguments

WPI argues that Abi-Nassif and DOCSIS 1.1, individually or in combination, fails to describe the step of “operating the CPE in the grant pending absent state.” PO Resp. 31. Based on this fundamental position, WPI identifies a number of specific alleged failures of either Abi-Nassif or DOCSIS 1.1 to describe lower level aspects of the recited method of claim 1. *Id.* For the reasons expressed below, we do not find any of WPI's arguments to be persuasive on the record before us.

- a) “operating the CPE in a grant pending state . . . transitioning from the grant pending state to a grant pending absent state . . . and the CPE has no pending bandwidth requests”

WPI argues TCT's reliance on Abi-Nassif as describing this first step of the claimed method fails because Abi-Nassif “has no description of a ‘grant pending absent’ state and therefore cannot teach or suggest ‘transitioning from the grant pending state to a grant pending absent state.’” PO Resp. 33. WPI supports its argument solely with Dr. Lomp's unsupported testimony. *Id.* (citing Ex. 2001 ¶ 38). For the reasons expressed immediately below in our discussion of the next recited step in the claimed method, we determine that Abi-Nassif describes the claimed grant pending absent state.

- b) “transmitting a first type bandwidth request . . . when the CPE receives data for transmission”

WPI argues that neither Abi-Nassif nor DOCSIS 1.1 describes operating the CPE in a grant pending absent state because neither prior art reference describes “transmitting a first type bandwidth request . . . when the

CPE receives data for transmission.” *Id.* at 34 (citing Ex. 1022, 23:1–5, Ex. 2001 ¶ 40). WPI argues that TCT’s reliance upon Abi-Nassif’s INACTIVE state as correlating to the claimed grant pending absent state is flawed for two reasons. First, WPI contends that Abi-Nassif does not describe “transmitting a first type bandwidth request to the BSC without entering into contention’ . . . while operating in its INACTIVE state.” *Id.* (citing Ex. 2001 ¶ 40). Our review of TCT’s argument and evidence reveals that WPI’s argument is unpersuasive.

Abi-Nassif’s MAC user is in one type of INACTIVE state while it is waiting for data to send upstream and is receiving unicast polling requests from primary station 102. Ex. 1022, 23:1–13. The MAC user may enter this type of INACTIVE state after the MAC user has finished sending data over a channel obtained via contention. *See id.*, 22:30–23:21, Figure 9 (moving from CONTENTION to ACTIVE after REQUEST ACCEPTED and then from ACTIVE to INACTIVE after REQUEST SATISFIED). When in this type of INACTIVE state, the MAC user remains inactive until it receives new data to send and then the MAC user requests permission to send those data in response to the next unicast polling request from primary station 102. *See id.* at 23:1–5, Figure 9 (moving from INACTIVE to ACTIVE via NON-CONTENTION REQUEST). Abi-Nassif need not recite explicitly a “grant pending absent state” to describe such a state. *In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009). We determine that Abi-Nassif describes the claimed grant pending absent state.

Second, WPI also contends that the unicast polling mechanism described by Abi-Nassif involves the MAC user transitioning from INACTIVE to ACTIVE before sending a bandwidth request because Abi-

Nassif states that the transition happens “upon receiving a contention-free opportunity to transmit a request.” PO Resp. 34 (quoting Abi-Nassif 23:2–3). WPI relies solely upon Dr. Lomp’s testimony to support its contention. *Id.* (citing Ex. 2001 ¶ 40). WPI’s argument is unpersuasive.

The Specification describes the claimed “first type bandwidth request” as follows: “CPE 13 is periodically (e.g., every 10 ms) polled by BSC 12 with a unicast request slot. CPE 13 can use this unicast request slot *to request a data slot* for sending upstream data to the base station controller.” Ex. 1001, 7:27–31 (emphasis added). The cited portion of Dr. Lomp’s testimony merely parrots WPI’s argument without explaining why Abi-Nassif’s use of unicast polling is not precisely the same as the claimed system’s use of the very same technique of “transmitting a first type bandwidth request.” Ex. 2001 ¶ 40.

Based on the evidence of record, we conclude that TCT has established that Abi-Nassif describes this step of the claimed method.

- c) “transitioning operation of the CPE from the grant pending absent state to the grant pending state after a subsequent bandwidth grant is received at the CPE”

WPI also argues that Abi-Nassif fails to describe the step of “transitioning operation of the CPE from the grant pending absent state to the grant pending state after a subsequent bandwidth grant is received at the CPE.” PO Resp. 35. WPI contends that “Abi-Nassif describes that the transition occurs when the opportunity to request is received . . . , not after a bandwidth grant is received as is set forth in the claim.” *Id.* (citing Ex. 2001 ¶ 41). Dr. Lomp’s testimony that is cited by WPI merely parrots WPI’s argument without providing meaningful evidentiary support. Ex. 2001 ¶ 41.

TCT persuasively responds that, while not expressly shown in Abi-Nassif's Figure 9, the Figure implies by REQUEST SATISFIED that the MAC user receives a bandwidth grant before sending data in the ACTIVE state. Reply 8. TCT also points out that Abi-Nassif, via its incorporation of DOCSIS 1.0, expressly describes the bandwidth grant that precedes the MAC user transitioning to the ACTIVE state (i.e., the grant pending state). Reply (citing Ex. 1034 §§ 6.4.1.1.1, 6.4.1.1.5 (describing details of unicast polling)). Accordingly, we determine that TCT has established that Abi-Nassif describes this step of the claimed method.

- d) "transitioning operation of the CPE from the grant pending absent state to an idle state if the CPE does not transmit any first type bandwidth request to the BSC during a timeout period"

The Specification describes its "idle state" as "a waiting state in which the customer premises equipment awaits arrival of data packets to send as upstream data to the base station controller." Ex. 1001, 6:49–51. Once in this type of "idle state," the CPE must use contention to obtain permission to transmit data. See Ex. 1001, Figure 2 (illustrating idle state 20 with only one pathway through transmitting data using contention). The Specification also describes the CPE as waiting for data to transmit during the grant pending absent state. *Id.* at 7:24–25. Despite not having data to transmit, the CPE remains in the grant pending absent state until a timeout period expires. If the CPE receives data to transmit before the timeout occurs (i.e., during the grant pending absent state), the CPE can request a data slot without contention by responding to a unicast polling request. *Id.* at 7:27–35. If the timeout occurs before the CPE receives data to transmit, the CPE transitions back to idle state 20 in which it must use contention to reacquire a data slot

to transmit data. *Id.* at 7:42–44. Thus, the CPE can be inactive (i.e., waiting for data to transmit) during the grant pending absent state and the idle state. Simply not having data to transmit is not the same as being in an “idle state,” as used in the Specification. Rather, the “idle state” of claim 1 refers to a state in which the CPE is waiting for data to transmit and must use contention to obtain a data slot for transmitting any data that it receives.

TCT contends that Abi-Nassif describes both types of inactive states. Abi-Nassif describes the grant pending absent state in which the MAC user can use non-contention responses to unicast polling to obtain a data slot. *See* Ex. 1022, Figure 9 (illustrating counterclockwise transition from INACTIVE to ACTIVE via NON-CONTENTION REQUEST at bottom of figure). TCT argues that the “NON-CONTENTION REQUEST” of Figure 9 corresponds to the “first type bandwidth request” of claim 1. Abi-Nassif also describes the idle state in which the MAC user must use contention to obtain a data slot. *See id.* (illustrating clockwise transition from INACTIVE to CONTENTION via CONTENTION REQUEST followed by transition to ACTIVE via REQUEST ACCEPTED). TCT concedes, however, that Abi-Nassif does not expressly describe the timeout period that determines whether the transition from INACTIVE to ACTIVE occurs in the counterclockwise or clockwise direction of Figure 9. Pet. 47.

TCT contends that, like Abi-Nassif and the '991 patent, DOCSIS 1.1 also uses unicast polling to enable the CM to reserve upstream data slots without contention. *Id.* More specifically, TCT identifies the nrtPS and rtPS service flows described by DOCSIS 1.1, which include a configurable “timeout” for “inactivity” that “specifies the maximum duration resources remain unused on an active Service Flow.” *Id.* (quoting Ex. 1019, Appendix

C.2.2.5.7). While these services flows are active, the CM will not need to use contention to send upstream data. Ex. 1019 §§ 7.1.3, 8.2.2, 8.2.4; Ex. 1005 ¶ 167. If the timeout period expires before the CM responds to a unicast poll with a bandwidth request, then the service flow terminates and its unicast polling requests stop arriving. Pet. 47 (citing Ex. 1019 § 8, C.2.2.5.7; Ex. 1005 ¶ 241). Without such unicast polling requests, the CM enters an idle state in which it must use contention-based methods to obtain a grant of bandwidth.

WPI argues that DOCSIS 1.1 fails to describe the claimed “idle state” for three primary reasons. First, WPI contends that the “idle state” shown in Figure K-1 of DOCSIS 1.1 is not associated with the “timeout” of services flows relied upon by TCT. PO Resp. 36–37 (citing Ex. 2001 ¶ 43). WPI’s argument is unpersuasive. TCT relies upon the descriptions of how the rtPS and nrtPS service flows of DOCSIS 1.1 operate, not Figure K-1, as illustrating the transition from a grant pending absent state to an idle state. Pet. 47–48, 58–59; *see also* Ex. 1043 (Dr. Lomp testifying that Petition does not rely upon Figure K-1 as illustrating the claimed transition). Based on our review of Figure K-1, we determine that it addresses aspects of the DOCSIS 1.1 system other than the operation of the service flows upon which TCT relies. DOCSIS 1.1 describes Figure K-1 as merely exemplifying “transmission and contention resolution” with “a few simplifications” and “a few assumptions” that is “should be sufficient to get the basic point across.” Ex. 1019, 299. For example, Figure K-1 wholly fails to address details of the CM’s transmission of data in response to the unicast polling that occurs using the QoS enhancements enabled by the rtPS and nrtPS service flows. *Id.*

Second, WPI contends that an ordinarily skilled artisan would not have added the idle state of Figure K-1 to Abi-Nassif's INACTIVE state because the two states "equate[] quite well." PO Resp. 37 (citing Ex. 2004 ¶ 4). WPI's argument is unpersuasive because TCT does not rely upon the "idle state" shown in Figure K-1 but instead relies upon the rtPS and nrtPS service flows described in DOCSIS 1.1. Pet. 47–49. Moreover, the "idle state" of Figure K-1 corresponds to a state in which the CM would use contention to obtain a data slot after the CM receives data to send to the CMTS. Abi-Nassif describes two INACTIVE states, one INACTIVE state that is similar to the idle state of Figure K-1⁴ and another INACTIVE state that is similar to the state enabled by the rtPS and nrtPS service flows.⁵ TCT persuasively demonstrates that the use of unicast polling that is described by both Abi-Nassif and DOCSIS 1.1 along with Abi-Nassif's incorporation of DOCSIS 1.0 explains why an ordinarily skilled artisan would have found it obvious to incorporate the timeout of rtPS and nrtPS service flows into the functionality of the latter type of INACTIVE state described by Abi-Nassif.

Third, WPI contends that the timeout of rtPS and nrtPS service flows merely terminates the service flow in the CMTS rather than starting an "idle state" at the CM. PO Resp. 38–40 (citing Ex. 2001 ¶ 44–47). This argument presumes that the claim requires the transition to the idle state must be performed by the CPE. WPI's argument is not persuasive. Even if the claim

⁴ This type of INACTIVE state transitions to ACTIVE clockwise across the top of Abi-Nassif's Figure 9 upon successfully using contention to obtain a data slot. See Ex. 1022, Figure 9.

⁵ This type of INACTIVE state transitions to ACTIVE from left to right across the bottom of Abi-Nassif's Figure 9. See Ex. 1022, Figure 9.

were to include such a requirement, the timeout terminates the service flows for both the CMTS and the CM, Ex. 1019, 251, after which the CM transitions to an idle state because it can no longer use the non-contention service flows (rtPS and nrtPS) to transmit data, it must use contention.

For the reasons expressed above, we determine that TCT has established by a preponderance of evidence that the combined teachings of Abi-Nassif and DOCSIS 1.1 render claim 1 obvious.

5. Dependent Claims 3–5

a) Claims 3 and 4

Claim 3, which depends directly from claim 1, recites a method in which “the CPE is further operated in a deferring state in which the CPE determines when to transmit a second type bandwidth request.” Ex. 1001, 12:31–33. Claim 4 depends from claim 3 and further recites: “wherein the CPE attempts to transmit the second type bandwidth request in a contention slot provided by the BSC.” *Id.* at 12:34–36. Based on our review of the Specification, the “second type bandwidth request” refers to a contention-based request for bandwidth (i.e., a “REQ message”). *Id.* at 6:57–7:9.

TCT contends that Abi-Nassif describes the claimed “deferring state” as “delaying retransmissions [of contention requests using] a binary exponential backoff approach.” Pet. 49 (citing Ex.1022, 20:5–11; Ex.1005 ¶¶ 253–54). TCT contends that Abi-Nassif also describes the limitations introduced in claim 4. *Id.* (citing Ex. 1022, 23:1–7).

WPI does not address TCT’s reliance on Abi-Nassif’s teaching of the “deferring state” recited in claim 3 of the transmission of the “second type bandwidth request” recited in claim 4. *See* PO Resp. 49–51 (addressing only alleged deficiencies in DOCSIS 1.1). WPI also cites no testimony from

Dr. Lomp on the subject. *Id.* Based on our review of the cited portions of Abi-Nassif and the cited testimony of Mr. Lipoff, we determine that TCT has established that Abi-Nassif describes the limitations introduced in claims 3 and 4.

b) Claim 5

Claim 5, which depends directly from claim 1, recites a method in which “in the grant pending state, the CPE transmits a third type bandwidth request in the bandwidth allocated to the CPE for transmitting upstream data.” Ex. 1001, 12:37–40. Based on our review of the Specification, the “third type bandwidth request” refers to a piggybacking type request. *Id.* at 7:17–19.

TCT contends that Abi-Nassif describes the limitations introduced in claim 5 because Abi-Nassif describes its MAC user employing piggybacking while in the ACTIVE state shown in its Figure 9. Pet. 50 (citing Ex. 1022, 21:5–8, 23:17–21). WPI does not address TCT’s reliance on Abi-Nassif’s teaching of the limitations introduced in claim 5. See PO Resp. 51 (addressing only alleged deficiencies in DOCSIS 1.1). WPI also cites no testimony from Dr. Lomp on the subject. *Id.* Based on our review of the cited portions of Abi-Nassif, we determine that TCT has established that Abi-Nassif describes the limitations introduced in claim 5.

6. *Conclusion*

Based on a preponderance of the evidence before us, we conclude that TCT established that the combined teachings of Abi-Nassif and DOCSIS 1.1 render claims 1 and 3–5 unpatentable as obvious.

E. OBVIOUSNESS IN VIEW OF SEN, APA, AND RYDNEILL

TCT argues that the combination of Sen, APA, and Rydnell renders claims 1 and 3–5 unpatentable as obvious. Pet. 61–70. For the reasons expressed below, we are persuaded that TCT has established by a preponderance of evidence that Sen alone renders claims 1 and 3–5 obvious, and thus demonstrates that the combination renders the those claims obvious.

1. Overview of Sen

Sen discloses a wireless General Packet Radio Service (“GPRS”) that purports to use a novel MAC protocol to improve delivery of real-time data traffic like speech, video, multimedia, and VoIP that is sensitive to delays in transmission. Ex. 1023, Abstract, 1:6–9, 1:47–49. Sen’s protocol supports wireless data transmission between mobile stations and a base station. *Id.* at 2:49–67, Figure 1. Sen enables a mobile station to resume transmitting data without re-entering a contention state as a way of improving the quality of service for “delay-sensitive, real-time GPRS traffic.” *Id.* at 4:50–5:3.

Sen describes a:

Packet Standby state 44 [that] permits the MS 26 to stay connected to the network 10 through a physical channel even though it may not need to send any data. This facilitates a fast switch from the inactive state to being able [to] transmit data immediately when the MS 26 becomes “active.”

Id. at 4:50–55. The relationship among Packet Standby state 44 and other states are shown in Figure 4, which is reproduced below.

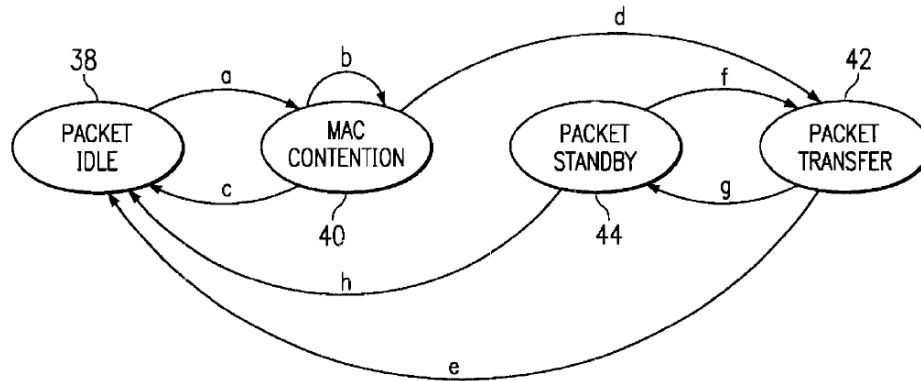


Fig. 4

Sen's Figure 4 illustrates network state transitions in Sen's communication system including "packet standby" state 44.

2. Overview of Rydnell

Rydnell also discloses aspects of a MAC protocol used in a wireless data communication network. Ex. 1024, Abstract. Rydnell focuses on reducing the delay of the transmission of packetized data in the network by providing a "variable fast page mode" ("FPM"). FPM 306 is shown in Rydnell's Figure 3, which is reproduced below.

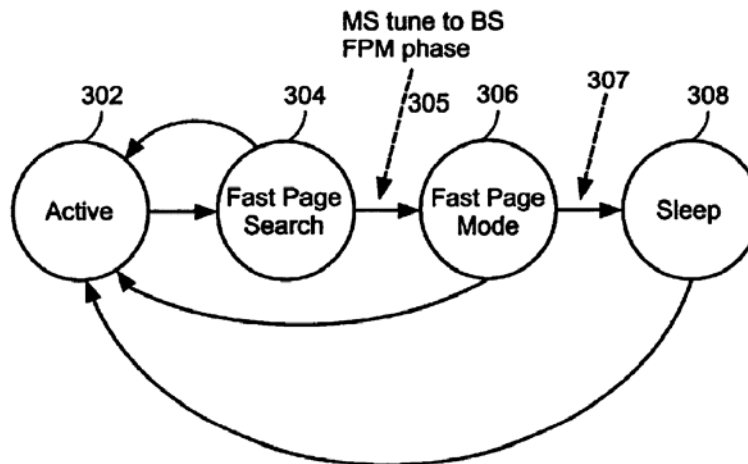


FIG. 3

Rydnell's Figure 3 illustrates network state transitions in Rydnell's communication system including "fast page mode" state 306.

Packet data are exchanged in the active mode until a first inactivity timer expires. *Id.* at 4:4–6. The mobile station then enters FPM state 306. *Id.* at 5:45–60. In the FPM state, the mobile station can establish subsequent MAC transactions without the need to make contention based access attempts. *Id.* at 6:8–16. Once an uplink MAC transaction is established, the mobile station returns to Active mode 302. *Id.* at 6:17–19.

Uplink opportunities are repeated as long as the FPM inactivity timer (T2) does not expire. But if it does expire, the mobile station enters a sleep-mode 308. *Id.* at 6:20–22. If the mobile station detects a request to establish a MAC transaction based upon uplink data from the mobile station, it will re-enter the active mode 302. *Id.* at 6:23–27; *see also* FIG. 4B and 6:63–7:12. In this way, Rydnell’s mobile station does not have to remain in the Active mode to receive a higher QoS. *Id.* at 7:13–28.

3. TCT’s Argument and Evidence

TCT argues that Sen describes every element of claim 1 but combines teachings from the APA and Rydnell to bolster its argument that specific aspects of the claim would be obvious if we were to determine that Sen did not describe them. Pet. 62–68. More specifically, TCT cites the APA’s piggybacking technique of including a request for bandwidth within transmitted data, *see* Ex. 1001, 1:55–63, 5:63–6:6, as describing the requirement that, in the grant pending state, the CPE “transmits further bandwidth requests using the granted bandwidth.” Pet. 64. TCT argues that applying piggybacking to Sen is merely applying “a known technique [piggybacking] to a known device ready for improvement [Sen] to yield predictable results” of reducing contention traffic. *Id.* (quoting Manual of Patent Examining Procedure (MPEP) § 2143(I)(D).) TCT argues that an

ordinarily skilled artisan would have been motivated to implement piggybacking in Sen's LLC block headers to obviate the need to send a separate "Packet Resource Request" message, which would improve "efficiency of resource utilization." *Id.* at 64–65 (citing Ex. 1005 ¶ 335).

TCT relies upon Rydnell as further describing the claimed step of "transitioning operation of the CPE from the grant pending absent state to an idle state if the CPE does not transmit any first type bandwidth request to the BSC during a timeout period." *Id.* at 67. TCT contends that Rydnell describes "repeating uplink opportunities 444 to the mobile station in the FPM as long as an FPM inactivity timer (T_2) does not expire, at which expiry the mobile station enters a sleep-mode, which is an idle state." *Id.* (citing Ex. 1024 at FIG. 4B and 6:20–27; 6:63–7:13). TCT argues that an ordinarily skilled artisan would have been motivated to supplement Sen's technology with Rydnell's timeout method to conserve battery life in the mobile station. *Id.* at 68 (citing Ex. 1024, 2:57–60, 3:51–64; Ex. 1005 ¶¶ 359, 360). TCT also argues that the modification of Sen according to Rydnell is merely applying "a known technique [Rydnell's timeout method] to a known device ready for improvement [Sen] to yield predictable results" of improving battery life and increasing bandwidth efficiency. *Id.* at 68–69 (quoting MPEP § 2143(I)(D); citing Ex. 1005 ¶¶ 363–67).

4. Analysis of WPI's Counter Arguments

WPI argues that Sen "lacks the entire concept of a grant pending absent state." PO Resp. 52. Based on this fundamental position, WPI identifies a number of specific alleged failures of Sen to describe lower level aspects of the method of claim 1. *Id.* For the reasons expressed below, we do not find any of WPI's arguments to be persuasive.

- a) “operating the CPE in a grant pending state . . . transitioning from the grant pending state to a grant pending absent state . . . and the CPE has no pending bandwidth requests”

Initially, this first step requires “operating the CPE in a grant pending state wherein the CPE awaits receipt of a bandwidth grant from the BSC, receives the bandwidth grant, transmits data to the BSC using the granted bandwidth.” Ex. 1001, 12:3–6. WPI argues that Sen fails to describe the grant pending state because Sen awaits its bandwidth grant while operating in its MAC Contention state 40. PO Resp. 53–54.

WPI’s argument is unpersuasive. Sen need not use precisely the same words as claim 1 to meet the limitations recited in this step. Prior art “elements must be ‘arranged or combined in the same way as in the claim,’ [however] the reference need not satisfy an *ipsissimis verbis* test.” *In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009). In Sen’s MAC contention state 40, the MS sends a request for bandwidth (Packet Channel Request message 30), waits for a grant of bandwidth (a Packet Immediate Assignment message 32), and, once the grant is received (message 32), sends data using that grant (in packet transfer state 42). Ex. 1023, 3:40–45, 4:15–25, Figure 4. After entering the packet transfer state 42, Sen’s MS may seek additional bandwidth by sending a Packet Resource Request 34, which would be granted via a Packet Resource Assignment message 36 from base station 12. *Id.* at 3:45–49. Accordingly, we determine that Sen describes the claimed grant pending state as a combination of events occurring in its MAC contention state 40 and packet transfer state 42 and through its use of message 34 to request additional bandwidth while operating in packet transfer state 42.

This first step also recites: “transitioning from the grant pending state to a grant pending absent state once the CPE has transmitted upstream data to the BSC within a bandwidth specified by the bandwidth grant received from the BSC during the grant pending state and the CPE has no pending bandwidth requests.” Ex. 1001, 12:7–14. WPI also argues that TCT fails to explain how Sen describes this transition from the grant pending state to the grant pending absent state. PO Resp. 54–55. TCT contends that this transition occurs when Sen’s MS sends a number of empty packets causing the MS to transition from the packet transfer state 42 (i.e. grant pending state) to the packet standby state 44 (i.e., grant pending absent state). Pet. 65. However, WPI contends that “Sen does not define an empty packet nor when a MS might transmit an empty packet.” PO Resp. 54. Without such a definition, WPI argues that TCT thus fails to explain how Sen describes transitioning from the grant pending state to grant pending absent state “once . . . the CPE has no pending bandwidth requests.” *Id.* at 54–55 (quoting Ex. 2001 ¶ 59).

The preponderance of evidence establishes that Sen describes the recited transition from grant pending state to grant pending absent state. Sen describes the transition from the packet transfer state 42 to the packet standby state 44 as follows: “After the network 10 receives an arbitrary number of empty packets, the MS 26 enters (g) the Packet Standby state 44.” Ex. 1023, 6:5–7. Sen indicates that: “This arbitrary number may be static and/or dynamic and may be set by a system administrator.” *Id.* at 6:26–28. Sen also indicates that transmitting empty packets signifies a “state of inactivity” while sending non-empty packets signifies a “state of activity.” *Id.* at 4:42–44. Sen also describes the MS sending empty packets as

indicating that “the MS does not have any data to send.” *Id.* at 4:33–35.

Mr. Lipoff testifies that:

[O]ne of ordinary skill in the art would understand Sen’s description of sending “empty packets” here to mean that, although the MS is being granted recurring non-contention opportunities to send data upstream, the MS is not taking advantage of these opportunities. So either: a) nothing at all is being transmitted upstream from the CPE during these opportunities to send; or b) equivalently, these opportunities to send do not contain any actually data packet payload information.

Ex. 1005 ¶ 193.

Based on Mr. Lipoff’s testimony and our own review of Sen, we determine that Sen describes the claimed transition from the grant pending state to the grant pending absent state.

b) “transmitting a first type bandwidth request . . . when the CPE receives data for transmission”

WPI argues that Sen fails to describe transmitting a first type bandwidth request because Sen’s “control packets” cited by TCT “use contention.” PO Resp. 55–56. WPI cites a portion of Sen that describes the MS using a control channel in contention. *Id.* at 56 (citing Ex. 1023, 3:40–42). WPI’s argument is unpersuasive because it fails to address the evidence on which TCT relies. Sen describes a transition path (f) from Packet Standby to Packet Transfer shown in Figure 4 that occurs without contention. Ex. 1023, 4:64–67. TCT relies upon this disclosure in Sen among others to establish persuasively that Sen describes this limitation. Pet. 65–66 (citing Ex. 1023, 4:49–66, 5:38–45, 5:57–6:11). Accordingly, we conclude that Sen describes this limitation.

- c) “transitioning operation of the CPE from the grant pending absent state to the grant pending state after a subsequent bandwidth grant is received at the CPE”

WPI argues that Sen fails to describe the transition from the grant pending absent state back to the grant pending state “after a subsequent bandwidth grant is received at the CPE.” PO Resp. 56–57. WPI focuses on the following passage in Sen: “The MS 26 can then transmit the packets via the reduced amount of the original bandwidth when the packets again need to be transmitted.” *Id.* at 57 (citing Ex. 1023, 4:55–57). Essentially, WPI argues that Sen transitions back to the grant pending state before a subsequent bandwidth grant is received.

WPI’s argument is unpersuasive. TCT correctly points out that Sen does not transition from its Packet Standby state 44 back into the Packet Transfer state 42 until the base station “reallocates the original bandwidth to the mobile station.” Reply 22 (quoting Ex. 1023, 4:57–59). The reallocation involves reassigning the number of channels that the MS previously had from the original grant of bandwidth. Ex. 1023, 5:4–6. The claim does not preclude the sending of any data while the CPE is in the grant pending absent state. Rather, it only requires a transition from the grant pending absent state to the grant pending state “after a subsequent bandwidth grant.” We conclude that TCT has established by a preponderance of the evidence that Sen describes such a transition.

- d) “transitioning operation of the CPE from the grant pending absent state to an idle state if the CPE does not transmit any first type bandwidth request to the BSC during a timeout period”

TCT argues that Sen transitioning from the Packet Standby state 44 into the Packet Idle state 38 along pathway (h) shown in Sen’s Figure 4 if “a

release timer expires” constitutes the claimed step of transitioning from the grant pending absent state to idle. Pet. 66–67; Reply 23–24. WPI argues that Sen’s use of its “release timer” is insufficient to meet the claimed step for two reasons, PO Resp. 57, neither of which is persuasive for the reasons expressed below.

First, WPI argues that Sen fails to describe what event or events start its release timer. *Id.* By its plain language, the claimed step does not indicate when the timeout period begins. The Specification similarly fails to describe what event starts the timeout period that is associated with this claimed step. The Specification states only that: “If no new data is received by CPE 13 before a timeout in grant pending absent state 23, the state machine returns to idle state 20. A timeout of 50 ms has been found to work well.” Ex. 1001, 7:42–44. Accordingly, the only requirement in the claim is that the system keeps time and takes action when time expires.

Second, TCT fails to connect the release timer to “the CPE does not transmit any first type bandwidth request to the BSC” as recited in claim 1. The argument implies that the timeout period must precisely coincide with the failure to transmit a first type bandwidth request. However, the claim recites no such requirement. Rather, the claim merely requires that the system tracks whether a first bandwidth request has been sent while a timer is running and, if not, transitions from the grant pending absent state to idle.

Sen keeps time in the form of its “release timer” and, upon expiration, transitions from the Packet Standby state 44 (i.e., the grant pending absent state) into the Packet Idle state 38 (i.e., the idle state) along pathway (h) shown in Sen’s Figure 4. Sen indicates that its MS “releases” bandwidth when it stops sending data. Ex. 1023, 4:33–37. Based on our review of Sen

and all the relevant evidence of record, we determine that Sen's "release timer" runs while the MS has allocated bandwidth (e.g., in the Packet Standby state 44) to determine whether to release that bandwidth by returning to an idle state (e.g., Packet Idle state 38) because the MS has no data to send. If the release timer expires before the MS has data to send, the MS transitions from the Packet Standby state 44 (i.e., the grant pending absent state) into the Packet Idle state 38 (i.e., the idle state). Accordingly, we determine that Sen describes the claimed step.

For the reasons expressed above, we determine that TCT has established by a preponderance of evidence that Sen alone describes all aspects of claim 1. TCT couched its reliance upon Rydnell and admitted prior art as alternative arguments, and WPI realized as much and argued accordingly. See Pet. 64, 67; PO Resp. 51–52. Because we conclude that Sen describes every element of claim 1, we see no reason to address TCT's alternative reliance upon Rydnell or admitted prior art.

5. Dependent Claims 3–5

TCT relies solely upon a portion of Sen as describing the limitations that are introduced in dependent claims 3–5. Pet. 69–70. WPI argues that Sen fails to describe those limitations because TCT combines portions of Sen that describe "prior art systems" with other portions of Sen that describe its "invention." PO Resp. 59 (claim 3), 60 (claim 4), 61 (claim 5). WPI's argument is unpersuasive because Sen indicates that "[s]teps a-e [of Figure 4, the transition diagram of Sen's invention] are similar to those described in FIG. 3" (i.e., the transition diagram of the prior art system). Ex. 1023, 4:48–49. Accordingly, we consider the description of Sen's steps a-e in Figure 3 also to describe the corresponding steps in Figure 4. Based

on our review of the record before us, we determine that TCT has established by a preponderance of evidence that Sen describes the limitations introduced in dependent claims 3–5. Accordingly, we are persuaded that Sen renders the dependent claims unpatentable.

6. Conclusion

Based on a preponderance of the evidence before us, we conclude that TCT established that Sen alone or in combination with Rydnell renders claims 1 and 3–5 unpatentable as obvious.

III. CONCLUSION

For the reasons stated above, we determine that TCT has demonstrated by a preponderance of the evidence that claims 1 and 3–5 are unpatentable as obvious over the combined teachings of Abi-Nassif and DOCSIS 1.1 or the combined teachings of Sen and Rydnell.

IV. ORDER

For the reasons given, it is:

ORDERED that claims 1 and 3–5 of U.S. Patent 8,274,991 B2 are held to be *unpatentable* as obvious under 35 U.S.C. § 103 in view of the combined teachings of Abi-Nassif and DOCSIS 1.1;

FURTHER ORDERED that claims 1 and 3–5 of U.S. Patent 8,274,991 B2 are held to be *unpatentable* as obvious under 35 U.S.C. § 103 in view of Sen alone or in combination with Rydnell; and

FURTHER ORDERED because this is a final written decision, the 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.

IPR2016-01494
Patent 8,274,991 B2

PETITIONER:

John D. Zele
Jeremy D. Peterson
Bradford A. Cangro
Leeger Yu
Adam Brooke
MORGAN, LEWIS & BOCKIUS LLP
john.zele@morganlewis.com
jeremy.peterson@morganlewis.com
bradford.cangro@morganlewis.com
leeger.yu@morganlewis.com
adam.brooke@morganlewis.com
TCT-WPI-IPRs@morganlewis.com

PATENT OWNER:

Richard E. Campbell
Richard H. Sloss
Michael C. Jones
Jonathan D. Cheng
PROCOPIO, CORY, HARGREAVES & SAVITCH LLP
richard.campbell@procopio.com
richard.sloss@procopio.com
michael.jones@procopio.com
jonathan.cheng@procopio.com