

**United States Court of Appeals  
for the Federal Circuit**

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**INTELLECTUAL VENTURES I LLC,**  
*Plaintiff-Appellant*

v.

**T-MOBILE USA, INC., T-MOBILE US, INC.,  
ERICSSON INC., TELEFONAKTIEBOLAGET LM  
ERICSSON, UNITED STATES CELLULAR  
CORPORATION,**  
*Defendants-Appellees*

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2017-2434, 2017-2435

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Appeals from the United States District Court for the  
District of Delaware in Nos. 1:13-cv-01671-LPS, 1:13-cv-  
01672-LPS, Chief Judge Leonard P. Stark.

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Decided: September 4, 2018

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Before PROST, *Chief Judge*, MOORE and REYNA, *Circuit Judges*.

MOORE, *Circuit Judge*.

Intellectual Ventures I LLC (“IV”) appeals from a grant of summary judgment by the U.S. District Court for the District of Delaware that T-Mobile USA, Inc., T-Mobile US, Inc., Ericsson Inc., Telefonaktiebolaget LM Ericsson, and United States Cellular Corporation (collectively, “T-Mobile”) have not infringed U.S. Patent No. 6,640,248. Because we hold that the district court’s grant of summary judgment resulted from an erroneous claim construction, we vacate and remand. We affirm the district court’s determination regarding indefiniteness.

#### BACKGROUND

The ’248 patent describes “an application-aware resource allocator” that allocates bandwidth resources to transmit information from software applications over a packet-switched network. ’248 patent at Abstract, 2:64–3:2. The patent explains that quality of service (“QoS”) requirements may vary among applications, with some types of applications demanding, for instance, error minimization, and others prioritizing speed. *Id.* at 14:43–50. To meet these varying requirements, the application-aware resource allocator “allocates bandwidth resource to an application based on an application type.” *Id.* at 3:50–51. In particular, the application-aware resource allocator allocates resources to an internet protocol (“IP”) flow of IP packets associated with the application. *Id.* at 3:60–61.

The '248 patent describes the application-aware resource allocator with reference to the seven-layer Open Systems Interface networking protocol stack standard (“OSI standard”), which includes a “physical layer” at layer 1, a “data link layer” at layer 2, a “network layer” at layer 3, a “transport layer” at layer 4, and an “application layer” at layer 7. *Id.* at 42:24–28. The OSI standard is illustrated in Figure 4 of the '248 patent, below, which depicts the physical layer 402, the data link layer 404, the network layer 406, the transport layer 410, and the application layer 412.

As shown in Figure 4, at the data link layer 404 is a “media access control (MAC) layer 414,” which includes

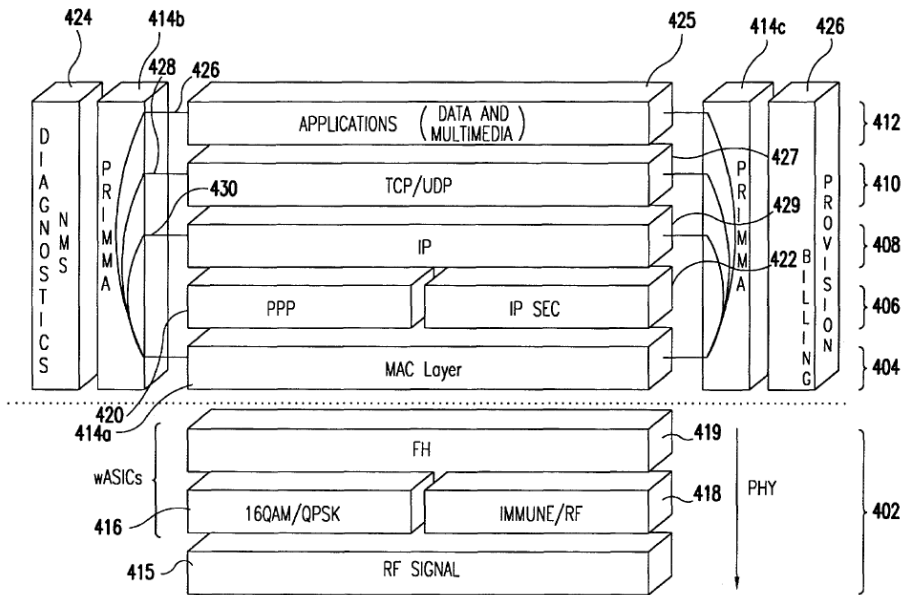


FIG. 4

“MAC layer portion 414a” and the application-aware resource allocator, labeled as “proactive reservation-based intelligent multi-media access (PRIMMA)” portions 414b, 414c. *Id.* at 42:42–47. The '248 patent teaches that the application-aware resource allocator at the MAC layer 414 can determine the QoS requirements for an application by analyzing information obtained from application

layer 412, transport layer 410, or network layer 408. *Id.* at 42:47–53.

The '248 patent includes independent claims 1 and 20, which recite:

1. An application aware, quality of service (QoS) sensitive, media access control (MAC) layer comprising:

*an application-aware resource allocator at the MAC layer, wherein said resource allocator allocates bandwidth resource to an internet protocol (IP) flow associated with a software application of a user based on IP QoS requirements of said software application, wherein said resource allocator allocates said bandwidth resource in a packet centric manner that is not circuit-centric and does not use asynchronous transfer mode (ATM).*

20. *An application-aware media access control (MAC) layer for optimizing end user application internet protocol (IP) quality of service (QoS) to IP flows comprising:*

identifying means for identifying an application type of a software application associated with an IP flow; and

*allocating means for allocating resources to said IP flow, responsive to said identifying means, so as to optimize end user application IP QoS requirements of said software application, wherein said resource allocating means allocates resources in a packet-centric manner that is not circuit-centric and does not use asynchronous transfer mode (ATM).*

*Id.* at 83:6–15; 84:42–53 (emphases added).

The parties disputed the construction of “application-aware resource allocator” in claim 1 and “application-aware media access control (MAC) layer” in claim 20. IV offered a construction requiring that the resource allocator “allocate[] resources based on application type.” J.A. 4419. Under IV’s construction, the application type can be discerned by the resource allocator using information obtained from any of the network layer 3, the transport layer 4, and the application layer 7. J.A. 4419–20. By contrast, T-Mobile offered a construction requiring that the resource allocator not only “ha[ve] knowledge of the type of data application,” but that it “further take[] into account, when allocating bandwidth, information about applications at [OSI] application layer 7.” J.A. 4422. According to T-Mobile, the application-aware resource allocator must allocate resources using information obtained from the application layer 7.

The district court adopted T-Mobile’s construction of “application-aware resource allocator.” J.A. 106–08. According to the district court, when allocating bandwidth, the application-aware resource allocator must take into account information obtained from the application layer 7. J.A. 107. It noted this construction was “supported by the prosecution history, during which the patentee distinguished its invention from prior art based on the fact that the invention is ‘aware of layer 7 application information’ and, further, that the resource allocator must ‘be able to take into account, when allocating bandwidth, information at . . . layer 7.’” J.A. 107 n.7.

The parties also disputed the construction of the means-plus-function claim language “allocating means for allocating resources to said IP flow . . . so as to optimize end user application IP QoS requirements of said software application.” While IV argued the function was “allocating resources to said IP flow . . . so as to optimize end user

application IP QoS requirements of said software application,” T-Mobile countered that the function was indefinite. J.A. 4445–46. IV proposed as structure the “MAC downlink subframe scheduler module 1566 or MAC uplink subframe scheduler 1666,” and T-Mobile argued the ’248 patent discloses no structure. J.A. 4445–46.

The district court agreed with T-Mobile that the function for the “allocating means” was indefinite. J.A. 110–12. Noting the ’248 patent described QoS as “subjective” and “vary[ing] from user to user based on individual preferences,” it determined the patent does not “provide adequate guidance as to the meaning of ‘optimize,’” as used in claim 20, and does not “rectify the indefiniteness of the portions of the specification indicating that QoS is subjective and varies by user.” J.A. 112. The district court did not address the parties’ arguments regarding the corresponding structure. *Id.*

Following claim construction, IV submitted infringement contentions alleging T-Mobile’s products include the claimed application-aware resource allocator. T-Mobile moved to strike the infringement contentions, and the district court granted the motion, finding the infringement contentions “incorporate[d] only the first part of the Court’s construction” and omitted “the latter half of the Court’s construction—including the phrase ‘layer 7.’” J.A. 134. After denying IV’s motion for reconsideration, the district court granted T-Mobile’s motion for summary judgment of non-infringement, stating “IV’s opposition to summary judgment depends entirely on a claim construction position the Court has rejected.” J.A. 69–76.

IV appeals the grant of T-Mobile’s motion for summary judgment, arguing the district court erred in the construction of “application-aware resource allocator” and indefiniteness determination for “allocating means” upon which its grant of summary judgment was premised. We have jurisdiction under 28 U.S.C. § 1295(a)(1).

## DISCUSSION

Because it is based solely upon the intrinsic record, we review the district court's claim constructions de novo. *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, 135 S. Ct. 831, 841–42 (2015). We review a determination of indefiniteness de novo, though we review any factual findings about extrinsic evidence for clear error. *BASF Corp. v. Johnson Matthey Inc.*, 875 F.3d 1360, 1365 (Fed. Cir. 2017). We review the district court's grant of summary judgment under the law of the regional circuit, here the Third Circuit, which performs de novo review. *Akzo Nobel Coatings, Inc. v. Dow Chem. Co.*, 811 F.3d 1334, 1338 (Fed. Cir. 2016).

## I. “Application-Aware Resource Allocator”

IV argues the district court erred in construing “application-aware resource allocator” in claim 1 and “application-aware media access control (MAC) layer” in claim 20 as a resource allocator that “has knowledge of the type of data application and further takes into account, when allocating bandwidth, information about applications at [OSI] application layer 7.” According to IV, application awareness requires only that the resource allocator allocate resources based on application type, which can be discerned using information obtained from any of network layer 3, transport layer 4, or application layer 7.

We agree. “The words of a claim are generally given their ordinary and customary meaning as understood by a person of ordinary skill in the art when read in the context of the specification and prosecution history.” *Thorner v. Sony Comput. Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012). The plain language of the claims, the specification, and the prosecution history all support IV's construction.

The plain language of claims 1 and 20 does not specify how the resource allocator becomes “aware” of an applica-

tion. Claim 1, for example, recites only that the “resource allocator allocates bandwidth resource to an [IP] flow associated with a software application of a user based on IP QoS requirements of said software application.” There is no requirement in claim 1 that the “IP QoS requirements of said software application” be discerned using information obtained from application layer 7. Similarly, claim 20 provides that an “application-aware [MAC] layer” includes an “identifying means for identifying an application type of a software application associated with an IP flow” and an “allocating means for allocating resources to said IP flow, responsive to said identifying means.” Claim 20 requires identification of an “application type,” but does not specify that the application type be identified using information obtained from application layer 7.

The ’248 patent specification contemplates determining the “IP QoS requirements of said software application” in claim 1 and the “application type” in claim 20 using information obtained from any of network layer 3, transport layer 4, or application layer 7. It states, “[b]y using the present invention, . . . scarce wireless bandwidth can be conserved and dynamically allocated where needed by the QoS mechanisms associated with each application type.” ’248 patent at 22:8-12. While the resource allocator operates at data link layer 2, the patent teaches, “the nature and QoS requirements of each IP stream are determined by other portions of the system” and “communicated to” the resource allocator. *Id.* at 22:20–22. In some embodiments, the patent explains, “application-level [i.e., application layer 7] information about the nature of the application can be used by the system to assign appropriate QoS mechanism parameters to the IP stream,” while in others “information about the IP streams for use in configuring the appropriate QoS mechanism parameters can be extracted from packet headers” at network layer 3 and transport layer 4, such as



network layer 3 source and destination IP addresses or transport layer 4 packet source and destination port numbers. *Id.* at 22:26–29; 53:18–33. These embodiments are reflected in Figure 4, which illustrates the resource allocator receiving information from each of the application layer 7 (labeled 412), the transport layer 4 (labeled 410), and the network layer 3 (labeled 408), as indicated by arrows 426, 428, and 430, respectively. *Id.* at 42:47–51.

Many of the claims depending from claim 1 also reflect these embodiments. Claim 2, for example, provides that the “resource allocation is based upon input from at least one of: a packet header,” that is, information from network layer 3 or transport layer 4, “and a software application communication,” that is, information from application layer 7, “to said MAC layer.” Claim 10 recites that the “resource allocator allocates switching resource to said software application based on an application type,” and claim 11 mirrors claim 2, providing that the “application type is identified based on input from at least one of: a packet header; and a software application communication to said MAC layer.” And claim 19 provides that the “application type” can be recognized through “analysis of at least one of: . . . information operated on at layer 3 of the OSI model, information operated on at layer 4 of the OSI model, . . . and information operated on at layer 7 of the OSI model.” Any construction of claim 1 that required the resource allocator to allocate resources using only information obtained from application layer 7, and not from network layer 3 or transport layer 4, would render these dependent claims meaningless. Such a construction is “disfavored.” *Rambus Inc. v. Infineon Techs. AG*, 318 F.3d 1081, 1093 (Fed. Cir. 2003).

We conclude, therefore, that the plain meaning of “application-aware resource allocator,” read in context of the specification, supports IV’s construction, namely, a resource allocator that “allocates resources based on

application type,” which can be discerned using information obtained from any of network layer 3, transport layer 4, and application layer 7.

Nevertheless, T-Mobile urges us to adopt a construction that requires the “application-aware resource allocator” allocate resources using only information obtained from application layer 7, arguing statements made in the prosecution history disavowed the full scope of the claims. Since “[i]t is the claims that define the metes and bounds of the patentee’s invention,” “[t]he patentee is free to choose a broad term and expect to obtain the full scope of its plain and ordinary meaning unless the patentee explicitly . . . disavows its full scope.” *Thorner*, 669 F.3d at 1367 (citing *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc)). Disavowal is an “exacting” standard under which it must be established that the patentee “demonstrate[d] an intent to deviate from the ordinary and accustomed meaning of a claim term” through “expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.” *Epistar Corp. v. Int’l Trade Comm’n*, 566 F.3d 1321, 1334 (Fed. Cir. 2009).

The statements in the prosecution history T-Mobile cites do not meet this exacting standard. T-Mobile first cites two statements made by the patentee of the ’248 patent in a July 2002 Amendment and Reply (“2002 Reply”):

As will be apparent to those skilled in the art, “application aware” refers to the resource allocator’s knowledge of information from the Application layer seven (7) of the [OSI] model of network architectures.

J.A. 3515–16.

As would be apparent to those skilled in the art, “application awareness” refers to knowledge above the TCP or UDP layer.

J.A. 3520.

T-Mobile argues these statements demonstrate a restriction of “application awareness” to the embodiment in which the resource allocator allocates resources using information obtained from application layer 7. We disagree. These statements say only that “application awareness” means being aware of applications running at application layer 7. A subsequent statement in the 2002 Reply confirms this reading: “Thus, Applicant’s invention covers a MAC layer that is *aware of an application associated with an IP flow.*” J.A. 3520 (emphasis added).

The remainder of the 2002 Reply confirms this understanding of the patentee’s statements. For example, the patentee references Figure 15A of the ’248 patent, in which network layer 3 and transport layer 4 packet header information is used to allocate resources. As the ’248 patent explains, a “packet header identification component 1502 identifies [an] IP flow . . . based on [a] packet header,” and “analyzes the packet header” to “determine[] . . . the type of source application.” ’248 patent at 63:11–13, 36–41. “Once the type [of] source application has been determined by packet header information,” it states, “the QoS requirements for the application are determined” by the “packet characterization component 1504” in Figure 15A “using the source application information identified” by the packet header identification component 1502. *Id.* at 63:55–59, 64:14–19. The patentee’s reference to Figure 15A, depicting embodiments in which the resource allocator becomes application aware using information obtained from network layer 3 and transport layer 4 packet headers, is inconsistent with T-Mobile’s urged disavowal of these embodiments.

Even more telling is the patentee's addition, in the 2002 Reply, of claim 19, which expressly provides that the "application type" can be recognized through "analysis of at least one of: . . . information operated on at layer 3 of the OSI model, information operated on at layer 4 of the OSI model, . . . and information operated on at layer 7 of the OSI model." This shows that the patentee knew how to restrict the resource allocator to using information obtained from layer 7. If the patentee had intended to similarly restrict the resource allocator in claim 1, it could have done so using the language of claim 19, but did not. See *Unwired Planet, LLC v. Apple Inc.*, 829 F.3d 1353, 1359 (Fed. Cir. 2016). What's more, the addition of a *dependent* claim reciting that the resource allocator can use information obtained not only from application layer 7 but also from network layer 3 and transport layer 4 belies any disavowal of these latter embodiments in the *independent* claim from which it depends.

We see in the 2002 Reply no "intent to deviate from" the full scope of the claims. We conclude the statements T-Mobile cites in the 2002 Reply are not "expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope." *Epistar*, 566 F.3d at 1334.

T-Mobile also points to a statement made by the patentee in an April 2003 Amendment and Reply ("2003 Reply"):

The application awareness refers to knowledge by the system of the type of data application, such as, e.g., a voice over IP (VoIP) type data application, or a video type data application. The application awareness feature further refers to the aspect of the resource allocator that allows the resource allocator to be able to take into account, when allocating bandwidth, information about applications at [OSI] application layer 7.

J.A. 3499 (emphases removed). T-Mobile argues this statement imposes two distinct requirements for application awareness: first, that an application type be determined, and second, that the resource allocator allocate resources using information obtained from application layer 7. It concedes that application type can be discerned using information obtained from network layer 3 or transport layer 4, but maintains that application awareness *further* requires allocating resources using information obtained from application layer 7. We are not persuaded.

First, we do not read this statement as imposing two distinct requirements for application awareness. “[I]nformation about applications at [OSI] application layer 7” means just that: information about applications that are running at application layer 7. We understand the patentee to be stating that application awareness involves determining a type of an application and allocating resources based on the application type. As the patentee goes on to state in the 2003 Reply, “bandwidth can be dynamically allocated using the present invention . . . by tailoring allocations to the application needs associated with each application type.” J.A. 3500 (emphasis removed). T-Mobile’s suggestion that resource allocation must be done using something *other* than the determined application type is at odds with the claims and specification and leaves one wondering why the application type was determined in the first place. “There is no ‘clear and unmistakable’ disclaimer if a prosecution argument is subject to more than one reasonable interpretation, one of which is consistent with a proffered meaning of the disputed term.” *SanDisk Corp. v. Memorex Prods., Inc.*, 415 F.3d 1278, 1287 (Fed. Cir. 2005).

Second, other statements made in the 2003 Reply confirm that the patentee did not intend to limit the resource allocator to using information obtained from application layer 7. The patentee explains, for example, that network

layer 3 “source and destination IP addresses” in packet headers are “helpful in providing application aware preferential resource allocation.” J.A. 3500 (emphases removed). In particular, the patentee adds, they “can be analyzed to determine the type of a source application,” and “bandwidth can be dynamically allocated to where the bandwidth is needed by recognizing QoS requirements mechanisms associated with each application type.” J.A. 3500–01 (emphases removed). We conclude the statements T-Mobile cites are not “expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.” *Epistar*, 566 F.3d at 1334.

Having discerned no disavowal, we hold that the “application-aware resource allocator” in claim 1 and “application-aware media access control (MAC) layer” in claim 20 are not restricted to allocating resources using information obtained from application layer 7. We construe this claim language to have its plain meaning, which permits the resource allocator to allocate resources based on application type, which can be discerned using information from any of network layer 3, transport layer 4, and application layer 7.

II. “Allocating means for allocating resources to said IP flow . . . so as to optimize end user application IP QoS requirements of said software application”

IV argues the district court erred in determining the claimed “allocating means for allocating resources to said IP flow . . . so as to optimize end user application IP QoS requirements of said software application” is indefinite. According to IV, the specification provides sufficient structure to render the “allocating means” definite, but the district court erroneously failed to consider this structure after determining the function was indefinite. We do not agree.

Under 35 U.S.C. § 112, a patent claim must “particularly point[] out and distinctly claim[] the subject matter” regarded as the invention. In particular, a claim, viewed in light of the specification and prosecution history, must “inform those skilled in the art about the scope of the invention with reasonable certainty.” *Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120, 2129 (2014); see also *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (“The claims, when read in light of the specification and the prosecution history, must provide objective boundaries for those of skill in the art.”). While a claim employing a “term[] of degree” may be definite “where it provide[s] enough certainty to one of skill in the art when read in the context of the invention,” *Interval Licensing*, 766 F.3d at 1370, a term of degree that is “purely subjective” and depends “on the unpredictable vagaries of any one person’s opinion” is indefinite, *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1350–51 (Fed. Cir. 2005).

We conclude that the “QoS requirements” are entirely subjective and user-defined. The ’248 patent analogizes QoS to “a continuum, defined by what network performance characteristic is most important to a particular user” and characterizes it as “a relative term, finding different meanings for different users.” ’248 patent at 12:51–52, 62–65. “Ultimately,” the ’248 patent states, “the end-user experience is the final arbiter of QoS.” *Id.* at 14:39–40.

By the ’248 patent’s own terms, “optimiz[ing] . . . QoS” is a “term of degree” that, like the “aesthetically pleasing” limitation in *Datamize*, is “purely subjective” and depends “on the unpredictable vagaries of any one person’s opinion.” 417 F.3d at 1350–51. As in *Datamize*, merely understanding that “optimiz[ing] . . . QoS” relates to the end-user experience “fails to provide one of ordinary skill in the art with any way to determine whether” QoS has been “optimiz[ed].” We see no error in the district court’s

conclusion that this function is indefinite or that because the function is indefinite, there was no need to evaluate structure. We have similarly held a means-plus-function limitation indefinite without looking to structure where a term of degree in the function was sufficient to render the claim indefinite. *Interval Licensing*, 766 F.3d at 1369 n.4.

#### CONCLUSION

We construe “application-aware resource allocator” in claim 1 and “application-aware media access control (MAC) layer” in claim 20 to have their plain meaning, which permits the resource allocator to allocate resources based on application type, which can be discerned using information from any of network layer 3, transport layer 4, and application layer 7. Because the district court’s grant of summary judgment of non-infringement resulted from a contrary construction, we vacate and remand. We affirm the district court’s determination that the “allocating means” in claim 20 are indefinite.

#### **AFFIRMED-IN-PART, VACATED-IN-PART, AND REMANDED**

#### COSTS

No costs.