

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORPORATION,

Petitioner

v.

PROXENSE, LLC

Patent Owner.

IPR2025-00328

U.S. Patent 8,219,129

**DECLARATION OF JAMES L. LANSFORD, Ph.D.
IN SUPPORT OF INTER PARTES REVIEW OF U.S. PATENT 8,219,129**

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TABLE OF CONTENTS

I. Qualifications and Expertise.....	2
A. Education.....	3
B. Industry Experience.....	4
C. IEEE 802 Experience	7
II. Understanding of Relevant Legal Principles.....	9
III. '129 Patent – Technical Background and Overview	12
A. Technical Background.....	12
1. Wireless Communication Standard Overview	14
a) MAC.....	15
b) PHY	15
2. Wireless Personal Area Networks (WPANs)	16
a) High-Rate WPAN: IEEE 802.15.3	16
i. Starting a Piconet	18
ii. Joining and Leaving a Piconet.....	18
iii. Frame/Superframe.....	20
iv. CTA Allocation	21
v. Power Management.....	23
B. '129 Patent Overview.....	25
C. Prosecution History	28
D. Level of Ordinary Skill in the Art	28
E. Claim Construction.....	29
1. “synchronization information”.....	30
2. “class associated with one or more of the [] client device and [a/the] user of the [] client device”	32
3. “ <i>time slot</i> ” (all claims)	35
IV. Ground 1: The Combination of Gilb and 802.15.3 Renders Claims 1-2, 5-7, 16, and 18 Obvious.	36
A. Overview of the Combination	36
1. Overview of Gilb.....	36
2. IEEE 802.15.3 Standard (2003)	37

a)	Overview	37
b)	Public Availability of 802.15.3	37
3.	Motivation to Combine	42
B.	Independent Claims	45
1.	Independent Claim 16	45
a)	Preamble [16P]	45
b)	Limitation 16[A]	46
c)	Claim Limitation [16B].....	52
d)	Claim Limitation [16C].....	56
e)	Limitation [16D] and [16E]	60
i.	Power Management Status Allocation	62
ii.	QoS Allocation.....	68
2.	Independent Claim 18	75
a)	Preamble [18P].....	77
b)	Claim Limitation [18A]	79
c)	Claim Limitation [18B].....	80
d)	Claim Limitation [18C].....	80
e)	Claim Limitation [18D]	81
f)	Claim Limitation [18E]	81
3.	Independent Claim 1	83
a)	Preamble [1P].....	84
b)	Limitations [1A.1]/[1B.1]	84
iii.	“a first/second client device” and “a fixed proximity-based reader device”	84
iv.	“assigning a first/second specific time slot for a first/second client device to wirelessly communicate with” the PNC/DEV	88
c)	Claim Limitations [1A.2]/[1B.2]/[1D].....	91
d)	Limitation [1C]	94
C.	Dependent Claims	96
1.	Claim 2	96
2.	Claim 5	99

3.	Claim 6	99
4.	Claim 7	101
V.	GROUND 2: Claims 12, 13, and 15 Are Obvious Based on the Combination of Gilb, 802.15.3, and Cai.....	106
A.	Overview of the Combination	106
1.	Cai	106
2.	Motivation to Combine	109
B.	Independent Claim 12	110
1.	Preamble [12P]/System Components.....	111
2.	Limitation [12A]	114
3.	Limitation [12B].....	115
4.	“ <i>Time Slot</i> ” Limitations [12C]-[12D], [12F].....	116
5.	Limitation [12E].....	119
C.	Dependent Claims	119
1.	Claim 13	119
2.	Claim 15	119
VI.	GROUND 3: Claims 1, 2, 5-7, 16, and 18 Are Obvious Over the Combination of Gilb, 802.15.3, and Ward.....	120
A.	Combination Overview	120
1.	Ward	120
2.	Motivation to Combine	122
B.	Independent Claims.....	132
1.	“ <i>Class</i> ” Limitations.....	132
C.	Dependent Claims	135
VII.	GROUND 4: Claims 1-2, 5-7, 16, and 18 Are Obvious Based On the Combination of Gilb, 802.15.3, Ward, and Brawn	136
A.	Combination Overview	137
1.	IEEE 802.15.3 – Group Allocations.....	137
2.	Brawn	139
3.	Motivation to Combine Gilb, 802.15.3, Ward, and Brawn.....	141
B.	Independent Claims	152

1.	“Synchronization Information” Limitations – [1C], [16A-C], [18A]-[18B]	152
C.	Dependent Claims	155
VIII.	GROUNDS 5-6: The combination of Gilb, 802.15.3, Ward, and Cai and the combination of Gilb, 802.15.3, Ward, Brawn, and Cai each renders claims 12-13 and 15 obvious.	155
A.	Motivation to Combine	155
B.	Independent Claim 12	156
C.	Dependent Claims	156
IX.	Conclusion	157

I, James L. Lansford, do hereby declare the following:

1. I have been retained on behalf of Intel Corporation (“Petitioner”), to provide this Declaration concerning technical subject matter relevant to the Petition for Inter Partes Review of U.S. Patent No. 8,219,129 to Brown, et al. (“the ’129 patent”). It is my understanding that the ’129 patent is currently assigned to Proxense LLC.

2. I am over 18 years of age. I have personal knowledge of the facts stated in this Declaration and could testify competently to them if asked to do so. I have reviewed and am familiar with the specification and the claims of the ’129 patent. In general, I will cite to the specification of a United States Patent using the following formats: (Patent No., Col:Line Number(s)) or (Patent No., Paragraph Number(s)). For example, the citation (’129 patent, 1:1-10) points to the ’129 patent specification at column 1, lines 1-10. Also, for convenience, I use italics to denote limitations from the challenged claims. Any emphasis that I use in quotes within the declaration is added by me, unless otherwise noted.

3. All of the opinions contained in this Declaration are based on the documents I have reviewed and my knowledge and professional judgment. In forming the opinions expressed in this Declaration, I reviewed the documents listed in the attached Appendix A. I have also reviewed and am familiar with any other document referred to in this Declaration.

4. I have been asked to provide my technical opinions regarding how a person of ordinary skill in the art (“POSITA”) would have understood the claims of the ’129 patent at the time of the alleged invention. For purposes of whether the teachings of the prior art render the claims of the ’129 patent obvious, I have been asked to assume the date of January 6, 2006, the date of U.S. Provisional Application No. 60/760,362 for the analysis in this document. However, except as noted herein, my opinion would not change if the priority date of the ’129 patent was within a year or earlier. I have also been asked to provide my technical opinions on how concepts in the ’129 patent specification relate to claim limitations of the ’129 patent. In reaching the opinions provided herein, I have considered the ’129 patent, its prosecution history, and the references cited in Appendix A, and have drawn as appropriate on my own education, training, research, knowledge, and personal and professional experience.

I. Qualifications and Expertise

5. In formulating my opinions, I have relied on my knowledge, training, and experience in the relevant field, which I will summarize briefly. A more detailed summary of my background, education, experience, and publications is set forth in my curriculum vitae (“CV”), which is provided as INTEL-1004.

6. I have personal knowledge of the facts and opinions set forth in this declaration and believe them to be true. If called upon to do so, I would testify

competently thereto. I have been warned that willful false statements and the like are punishable by fine or imprisonment, or both.

7. I am being compensated for my time at my standard consulting rate. I am also being reimbursed for expenses that I incur during the course of this work. My compensation is not contingent upon the results of my study and analysis, the substance of my testimony, or the outcome of any proceeding involving the challenged patent or patents. I have no financial interest in the outcome of this matter or in any litigation involving the '129 patent.

8. I am currently the principal owner of Lansford Engineering LLC, a position I have held since 2012, and Farafir Consulting, a position I have held since June 2023.

9. I have worked in the signal processing and wireless communications field for over 40 years, with extensive CTO and senior technical leadership positions in three startups as well as established technology companies—including extensive leadership experience in standards bodies. In addition, I have many years of teaching and research experience in academia.

A. Education

10. I received a Bachelor of Science degree with Highest Honors in Electrical Engineering from Auburn University in 1980. In 1982, I received a Master of Science degree in Electrical Engineering from The Georgia Institute of

Technology. I received a Ph.D. in Electrical Engineering from Oklahoma State University in 1988.

B. Industry Experience

11. In the 1980s, I worked on a number of signal intercept systems for use by military and intelligence agencies. After receiving my doctorate in 1988, I did radar research at Georgia Tech, then became an Assistant Professor of Electrical Engineering at the University of Colorado at Colorado Springs. I taught classes and did research in digital signal processing and wireless communications. From 1994 through early 1996, I was the founder and Chief Technical Officer of Momentum Microsystems. My responsibilities at Momentum included serving as a system architect for an RF networking device based on a serial bus protocol as well as overseeing RF design, system analysis, software, and firmware.

12. From March through December 1996, I served as the President of Mobile Data Systems. I also served as the program manager for an AM subcarrier system and an interactive radio prototype for a toy sold by a major corporation. During the same time period, I taught short courses on CDMA technology and provided consulting services on wireless technology for clients including MIT and Microsoft.

13. From December 1996 through early 2000, I was a staff engineer and wireless systems architect at Intel's Communication Architecture Lab, where I was

responsible for the development of the HomeRF wireless standard. I also conducted reviews of potential RF wireless investments in areas such as Wireless Local Area Networks (“WLAN”) and Wireless Private Area Networks (“WPAN”). I also worked with Intel’s Bluetooth team; Intel was a founder of the Bluetooth Special Interest Group (“Bluetooth SIG”). I also worked as a senior wireless systems architect at Intel, designing and bringing to market wireless devices.

14. I was employed as Chief Technical Officer and Vice President of Business Development by Mobilian Corporation in Hillsboro, Oregon from February 2000 to November 2003. During my tenure at Mobilian, I was responsible for, among other things, strategy and tactics with respect to standard-setting bodies, including the IEEE, the Bluetooth SIG, the European Telecommunication Standards Institute’s Broadband Radio Access Network group (“ETSI/BRAN”), the Software Defined Radio forum, and the Wi-Fi Alliance (formerly known as WECA).

15. I was employed as Chief Technology Officer of Alereon, Inc. in Austin, Texas from November 2003 to February 2010. During my tenure at Alereon, I was responsible for, among other things, defining and executing on the company’s standards and regulatory strategy.

16. I was employed by Cambridge Silicon Radio (“CSR”) as a Fellow in the Global Standards Group from February 2010 to September 2015. After

Qualcomm acquired CSR in September 2015, I continued working for Qualcomm through May of 2023. While I was at CSR, among other work, I was the head of CSR's Wi-Fi Alliance and IEEE 802.11 Standards teams. I provide more detail of my experience with IEEE 802 Standards working groups below.

17. Since 2010 I have been a lecturer at the University of Colorado, Boulder, in the department of Computer Science. I have taught the Wireless Local Area Networks class in the graduate school since 2011, which is exclusively focused on IEEE 802.11 technology. Among other topics, I teach my students about the IEEE's standard setting processes, including the processes by which 802.11 Working Group participants submit and retrieve documents in order to discuss various proposals in periodic Working Group meetings. As part of those lectures, I show my students how to use the IEEE's Mentor website to find and download Working Group submissions, and we frequently review current proposals to evaluate their technical content.

18. I am the named inventor on multiple US patents related to wireless technology, including U.S. Patent No. 6,343,071, "Wireless Desktop Area Network" and U.S. Patent No. 11,412,524, "Techniques to Synchronize Radio Access Technologies for Co-Channel Operation."

C. IEEE 802 Experience

19. I have been a member of the Institute of Electrical and Electronics Engineers (“IEEE”) since 1985 (39 years) and am currently a Life Senior Member. I have participated in the activities of the IEEE Standards Association (“IEEE-SA”) continuously since 2010, and before that with some breaks in voting membership. I have participated in the IEEE 802.15 Wireless Personal Area Networks (“WPANs”) Working Group since 2000, also with some breaks in voting membership.

20. I have held numerous leadership positions in IEEE 802 over the last 25 years, including:

- Founding Chair, IEEE 802.19 Coexistence Working Group. In this role, I was a member of the Sponsor Executive Committee (“SEC”), the leadership team for all of the IEEE 802 standards (including 802.11, 802.3, and 802.15, among others).
- Vice-chair, IEEE 802.15.2 Wi-Fi Bluetooth Coexistence Technical Group.
- Chair, IEEE 802.11 DSRC Coexistence Tiger Team
- Chair, IEEE 802.11 Wireless Next Generation Standing Committee.
- Co-chair, IEEE 802.15.3a High Rate Alternative PHY Task Group 3a (TG3a).

21. While I was at Mobilian from 2000 to 2003, I regularly attended meetings of the IEEE 802.11 and 802.15 Working Groups and was an active contributor, having posted and presented several documents to both the 802.11 and 802.15 Working Groups. I regularly accessed and reviewed documents that were submitted by members of both the 802.11 and 802.15 working groups. In addition, during this period, I was the founding Chair of the IEEE 802.19 Coexistence Working Group, which gave me automatic membership in the IEEE 802 Sponsor Executive Committee (SEC), the group that oversees all working group activities in IEEE 802. During this period, the IEEE 802.11, 802.15, 802.18, and 802.19 Working Groups collaborated closely, including by holding meetings on the same dates and in the same venue, where attendees of any Working Group could and often did attend meetings of other Working Groups, by sharing document servers and websites, and by awarding cross credit across Working Groups, for attending sessions of any of the Working Groups, for purposes of gaining or maintaining voting privileges.

22. While I was at Aleron from November 2003 to February 2010, I was also the co-chair of the IEEE 802.15.3a Task Group, chair of the WiMedia Technical Steering Committee, co-chair of the WiMedia 60GHz Study Group, chair of the WiMedia Mobile Applications Study Group, Vice-Chair of the WiMedia Video Study Group, and a member of various other related boards and

working groups. During this period, the meetings of the 802.11 and 802.15 Working Groups continued to be held at the same times and places, the 802.11 and 802.15 Working Groups continued sharing document servers and websites, and the Working Groups continued allowing cross credit for attendance. The IEEE 802.11 and 802.15 Working Groups were also formally coordinated via a liaison. Because of my role as an 802.15 co-chair, I attended every such meeting from 2004 through early 2006. During my tenure at Alereon and as co-chair of the IEEE 802.15.3a Task Group, I also continued to regularly submit documents and to access and review documents that were submitted by other members of the 802.11 and 802.15 working groups.

23. While I was at CSR from February 2010 to September 2015, I was Vice Chair of the 802.11 Wireless Next Generation Standing Committee, in addition to being an active participant, contributor, and voting member of the IEEE 802.11 Working Group. After transitioning to Qualcomm, I became a director of technical standards, where I continued as an active member of the 802.11 Working Group and became Chair of the IEEE 802.11 Wireless Next Generation Standing Committee, among other work.

II. Understanding of Relevant Legal Principles

24. I am not a lawyer and will not provide any legal opinions. Although I am not a lawyer, I have been advised certain legal standards are to be applied by

technical experts in forming opinions regarding the meaning and validity of patent claims.

25. I understand that a patent claim is invalid if it is anticipated or obvious in view of the prior art, and that a claim can be unpatentable even if all of the requirements of the claim cannot be found in a single prior-art reference. I further understand that invalidity of a claim requires that the claim be anticipated or obvious from the perspective of a person of ordinary skill in the art at the time the invention was made.

26. I have been informed that a patent claim is invalid if it would have been obvious to a person of ordinary skill in the art. In analyzing the obviousness of a claim, I understand the following factors may be taken into account: (1) the scope and content of the prior art; (2) the differences between the prior art and the claims; (3) the level of ordinary skill in the art; and (4) any so called “secondary considerations” of non-obviousness, if they are present. I am not aware of any evidence of secondary considerations of non-obviousness relevant to the ’129 patent. I reserve the right to supplement this Declaration if Patent Owner (“PO”) introduces evidence of secondary considerations of non-obviousness.

27. I understand that to prove prior art or a combination of prior art renders a patent obvious, it is necessary to:

- a. identify the particular references that, singly or in combination, make the patent obvious;
- b. specifically identify which elements of the patent claim appear in each of the asserted references; and
- c. explain why a person of ordinary skill in the art would have combined the references, and how they would have done so, to create the invention(s) claimed in the patent.

28. I further understand that exemplary rationales that may support a conclusion of obviousness include:

- a. combining prior art elements according to known methods to yield predictable results;
- b. simple substitution of one known element for another to obtain predictable results;
- c. use of known technique(s) to improve similar devices (methods or products) in the same way;
- d. applying a known technique to a known device (method or product) ready for improvement to yield predictable results;
- e. “obvious to try” – choosing from a finite number of identified, predictable solutions with a reasonable expectation of success;
- f. known work in one field of endeavor may prompt variations of the work for use in either the same field or a different field based on

design incentives or other market forces if the variations are predictable to a person of ordinary skill in the art; and

- g. some teaching, suggestion, or motivating in the prior art that would have led a person of ordinary skill in the art to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

29. I have also been informed that, in considering obviousness, hindsight reasoning derived from the patent at issue itself may not be used.

III. '129 Patent – Technical Background and Overview

30. The '129 patent issued on July 10, 2012 from an application filed on January 5, 2007 and claims priority to Provisional Application No. 60/760,362 filed on January 6, 2006. The '129 patent relates “to a technique for wirelessly communicating with a plurality of client devices without data collision” and specifically, a technique where “individual client devices are assigned time slots during [sic] the client devices may wirelessly communicate.” (INTEL-1001, 4:25-30.) The wireless communication technique in the '129 patent may be based on the acknowledged prior art IEEE 802.15.4 protocol which is a wireless personal area network (WPAN) protocol. (*Id.*, 11:5-7.)

A. Technical Background

31. Historically, development of wireless technology proceeded along two main paths—voice and data networks. (INTEL-1020, 2.) However, market trends

toward data-oriented products and services and the merger of voice-oriented and data-oriented products and services drove voice-oriented networks to have increased data capabilities and data-oriented networks to efficiently transport voice. (*Id.*, 3.) Therefore, “the ideal wireless technology must efficiently transport voice, audio, and video in addition to data.” (*Id.*)

32. Voice, audio, and video have different requirements than data. (*Id.*) “For data, the most important parameter is throughput, but the delay (or latency) is not important” and for voice and video, “in addition to minimum throughput, the signal delay is very important.” (*Id.*) The fact that an ideal wireless technology does not exist “led to three main different wireless technologies—wireless local area networks (WLAN), wireless personal area networks (WPAN), and broadband wireless access (BWA) devices, also called wireless metropolitan area networks (WMAN).” (*Id.*, 3-4.)

33. The differences between WLAN and WPAN “arise from the different design goals.” (*Id.*, 4.) “WPAN devices are intended for very short-range communications—typically up to 10m” and are “used in small battery-powered devices” and “must consume very little power.” (*Id.*) “WLAN devices are intended for operation of up to 100m and have intermediate power consumption requirements.” (*Id.*) Thus, the technologies “differ in three ways: power levels and coverage, control of the media, and lifespan of the network.” (*Id.*, 133.)

1. Wireless Communication Standard Overview

34. The International Standardization Organization (ISO) developed a seven-layer model for communication systems, illustrated in Figure 1-4 below from Cooklev. (INTEL-1020, 35.) The “physical layer deals with the transfer of bits over an actual communication channel” and the “data link layer deals with the transfer of frames,” framing, and address information. (*Id.*) The network layer provides “for the transfer of packets across a communication network”; the session layer “controls the data exchange”; the presentation layer “handles the conversion of data from a machine-dependent form to a machine-independent form”; and the application layer “provide[s] services to the various applications.” (*Id.*)

Application	
Presentaion	
Session	
Transport	
Network	
	Logical Link Control (LLC)
Data Link	Medium Access Control (MAC)
Physical	Physical (PHY)

Figure 1–4: Mapping of ISO OSI to IEEE 802

35. The IEEE 802 standards “deal with the lowest two layers” and specifies the data link layer “in two sublayers, logical link control (LLC) and

medium access control (MAC).” (*Id.*, 35-36.) The wireless standards developed by IEEE 802 “specify the MAC layer and the physical layer.” (*Id.*, 36.)

a) MAC

36. The MAC “defines the way the medium (the communication channel) is shared among multiple users.” (INTEL-1020, 36.) The ultimate goal of the MAC “is to allow a large group of otherwise uncoordinated uses to efficiently use this shared medium.” (*Id.*) The basic requirements of the MAC are (a) the “MAC protocol must be independent of the underlying physical layer”; (b) the “access mechanism must be efficient for both bursty and periodic traffic”; and (c) the “MAC must handle mobile users.” (*Id.*, 39.)

b) PHY

37. The PHY “performs two functions, depending on whether the device is in transmit or receive mode.” (INTEL-1020, 40.) “In transmit mode, the PHY receives a bit stream from the MAC layer and performs signal processing operations such as error-correcting coding and modulation to convert the bit stream into an electric signal that is supplied to the antenna.” (*Id.*) “In receive mode, the PHY receives the electric signal from the antenna” and “converts the signal to a bit stream that is passed to the MAC.” (*Id.*)

2. Wireless Personal Area Networks (WPANs)

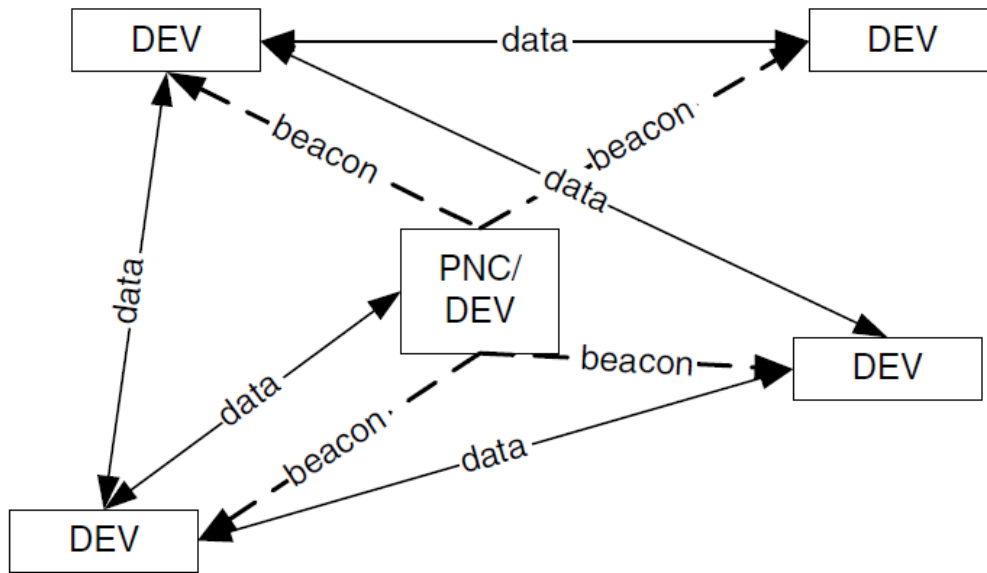
38. The IEEE 802.15 Working Group “has taken a leading role in WPAN technology development.” (INTEL-1020, 135.) Bluetooth was standardized as IEEE 802.15.1. IEEE 802.15.3-2003 is directed to a high-rate WPAN and 802.15.4-2003 is directed to low-rate WPAN. (*Id.*) I describe IEEE 802.15.3 in more detail in §IV.A.2.

a) High-Rate WPAN: IEEE 802.15.3

39. In November 1999, several companies including Kodak, Motorola, Cisco and Aware “initiated the work on a higher-speed WPAN technology, which became IEEE 802.15.3.” (INTEL-1020, 179.) The future portable consumer electronics devices such as digital cameras which must support multimedia traffic at high bit rates provided the main motivation. (*Id.*)

40. A communication network is often characterized by the area served by the network. (*See, e.g.*, INTEL-1005, 23.) The 802.15.3 protocol is designed for wireless personal area networks (WPANs), which are referred to in 802.15.3 as “piconets.” (*Id.*, 1 (“an introduction and explanation of the IEEE 802.15.3TM wireless personal area networks (WPANs) standard”), 23-25 (referring to “802.15.3 Piconet”); INTEL-1006, 1 (“Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for High Rate Wireless Personal Area Networks (WPANs)”), 8 (describing a piconet as “a wireless ad hoc data

communications system which allows a number of independent data devices (DEVs) to communicate with each other”).) I also note that the Bluetooth specification uses the term “piconet.” The two key elements of the 802.15.3 piconet, illustrated in Gilb’s Figure 3-1 below, are “the piconet coordinator (PNC) and the device (DEV).” (INTEL-1005, 25; INTEL-1006, 8.)



802.15.3, Figure 1

41. “The PNC is the center of the piconet, and the extent of the piconet is determined by the ability of DEVs to hear the beacon transmitted by the PNC.” (INTEL-1005, 25; INTEL-1006, 8; *see also* INTEL-1006, 9, 150-51.) “Every 802.15.3-compliant implementation is a DEV” in the piconet. (INTEL-1005, 25.) Accordingly, the PNC also “acts as a DEV” in the piconet. (*Id.*, 25, 300 (“The piconet controller (PNC) maintains a DEV personality in the piconet even as it

operates as the PNC.”); INTEL-1006, 168 (referring to “DEV personality of the PNC”); *see also* INTEL-1006, 8, Figure 1.)

i. Starting a Piconet

42. To create a piconet, a PNC-capable DEV “begins to search the channels to find other 802.15.3 piconets and to determine which channel has the least amount of interference.” (INTEL-1005, 31; INTEL-1006, 151.) If the DEV does not find another 802.15.3 piconet, “it would then start its own piconet by broadcasting a beacon.” (INTEL-1005, 31; INTEL-1006, 151-52.) “Although a network normally needs at least two devices to be considered an actual network, an 802.15.3 piconet is said to be in operation as long as the PNC is sending beacons, even if there are no other DEVs in the piconet.” (INTEL-1005, 32.) If the PNC’s beacon disappears “due to power outage, interference, etc.”, the “piconet will cease to exist after the timeout specified in the standard.” (*Id.*)

ii. Joining and Leaving a Piconet

43. After a piconet is established, “DEVs being to join the piconet using the association process.” (INTEL-1005, 34; INTEL-1006, 164-66.) The association process assigns an ID to the incoming DEV. (INTEL-1005, 34; INTEL-1006, 166.) Specifically, rather than using the complete MAC address, “which is 8 octets, for the source and destination,” IEEE 802.15.3 “requests that new DEVs joining the

piconet get an 8-bit ID, the DEVID, from the PNC to identify the DEVs messages in the piconet.” (INTEL-1005, 34.)

44. The PNC is able to refuse an association request for various reasons including “that the PNC does not have the resources to handle another DEV in the piconet.” (*Id.*, 34-35.)

45. A connected DEV can exit the piconet; “it ceases to be a member of the piconet because it requests to leave, the PNC tells it to leave, or through inactivity in the piconet.” (*Id.*, 35; INTEL-1006, 168-69.) For example, “[w]hen the DEV wants to leave the piconet, it sends a Disassociation command to the PNC” and “if the PNC wants the DEV to leave the piconet, it sends a Disassociation command to the DEV to tell the DEV that it is no longer a part of the piconet.” (INTEL-1005, 35; INTEL-1006, 168-69.) “When the DEV joins the piconet, the PNC assigns the DEV an association timeout period (ATP).” (INTEL-1005, 35.) “If the DEV does not successfully send a frame to the PNC at least once during an ATP, the PNC will consider the DEV to be disassociated and will eventually reuse the DEVID it assigned to that DEV for another DEV.” (*Id.*) And “if the DEV does not hear any communication from the PNC for an ATP, it considers itself disassociated and needs to search for a piconet to join.” (*Id.*)

iii. Frame/Superframe

46. The basic data structure in IEEE 802.15.3 “is called a frame instead of a packet.” (INTEL-1005, 47.) The standard defines five types of frames: “beacon, immediate acknowledgement (Imm-ACK), delayed acknowledgment (Dly-ACK), command, and data.” (*Id.*) In 802.15.3, frames are grouped into a repeating structure referred to as a superframe, illustrated in Figure 2 of 802.15.3 below. (INTEL-1006, 12.) A superframe is made up of three parts: the beacon, the contention access period (CAP), and the channel time allocation period (CTAP). (INTEL-1005, 32; INTEL-1006, 11-12.)

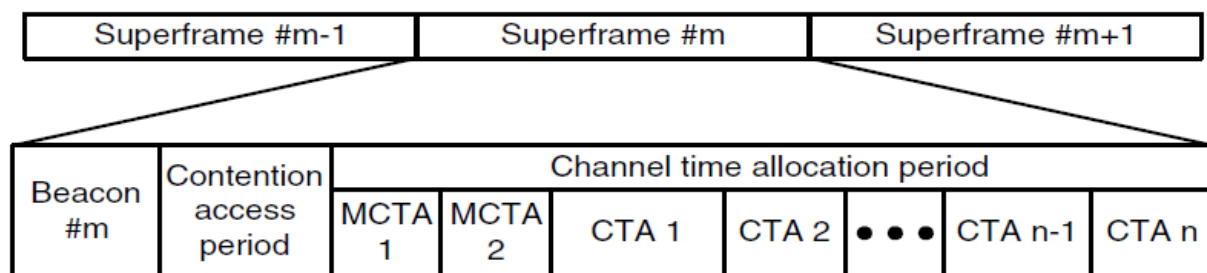


Figure 2—802.15.3 piconet superframe

47. The beacon “is used to set the timing allocations and to communicate management information for the piconet.” (INTEL-1006, 11.) The CAP “is used to transfer commands and data either between the PNC and a DEV or between the DEVs in the piconet.” (INTEL-1005, 33.) The access method for the CAP (**contention access period**) “is carrier sense multiple access with collision avoidance (CSMA/CA),” i.e., DEVs contend for access during the CAP duration.

(*Id.*) The CTAP “is composed of one or more” channel time allocations (CTAs) which are “allocated by the PNC to a pair of DEV identifiers (DEVIDs).” (*Id.*) “Only the DEV that is listed as the source is allowed to transmit in a CTA” so the CTAs within the CTAP are contention-free. (*Id.*; INTEL-1006, 172 (“DEV that is give[n] a directed CTA is guaranteed that no other DEVs will compete for the channel during the indicated time duration of the CTA”).) Channel access in the CTAP is based on “time division, multiple access (TDMA)” in which CTAs “have guaranteed start time and duration.” (INTEL-1005, 33; INTEL-1006, 171.)

iv. CTA Allocation

48. The PNC broadcasts the PNC Information Element which allows DEVs in the piconet to find out about other network DEVs. (INTEL-1005, 35.) This command includes a list of all DEVs in the piconet, their addresses, and capabilities. (*Id.*) Using this information, the DEV “is able to send small amounts of data to the other DEVs during the CAP or to request channel time from the PNC to send frames to other DEVs.” (*Id.*)

49. A DEV requests “channel time from the PNC to send frames to other DEVs” in a channel time request (CTRq). (*Id.*; INTEL-1006, 139-40 (describing CTRq).) IEEE 802.15.3 supports two types of CTRqs. The first, an “isochronous CTRq,” “is a request for channel time on a periodic basis that does not expire.” (INTEL-1005, 35; INTEL-1006, 139-40.) If the PNC agrees to the request, “it

issues a stream index that is unique in the current piconet and that corresponds to a specific source and destination pair of DEVs.” (INTEL-1005, 35.) A DEV can “request more than one allocation per superframe (a super-rate allocation), one allocation per superframe, or one allocation every n superframes (a sub-rate allocation).” (*Id.*; INTEL-1006, 140-41.) These types of “isochronous allocations are used so that the DEV can request the latency and throughput that is consistent with its application.” (INTEL-1005, 35.) Because “[i]nsufficient bandwidth or too much latency can make or break a product,” the ability for a DEV to “request and receive a specific amount of latency and throughput from the network is **extremely important.**” (*Id.*, 36.)

50. The second, an “asynchronous CTRq,” “is a request for a total amount of channel time that will be allocated whenever the PNC is able to fit it into the superframe.” (*Id.*; INTEL-1006, 139.) The PNC does not assign a stream index to an asynchronous allocation; instead, “all DEVs use the same stream index.” (INTEL-1005, 36.)

51. IEEE 802.15.3 supports “two types of CTAs: dynamic CTA and pseudo-static CTA.” (INTEL-1006, 172.) Pseudo-static CTAs are “allocated only for isochronous streams” whereas dynamic CTAs are “used for both asynchronous and isochronous streams.” (*Id.*)

52. The PNC considers received CTRqs and allocates the channel time in the CTAP of each superframe. (*See, e.g.*, INTEL-1005, 33, 56, 88-89, 93; INTEL-1006, 169-70, 180, 188-89.) The CTA allocations “are communicated to the DEVs in the piconet via the CTA IE in each beacon” which “contains one or more CTA blocks, each of which has the source, destination, stream index, start time, and duration of the CTA.” (INTEL-1005, 56-57; INTEL-1006, 117, Figures 25-26.)

v. Power Management

53. IEEE 802.15.3 has “four power management modes”—ACTIVE, asynchronous power save (APS), device synchronized power save (DPS), and piconet synchronized power save (PSPS). (INTEL-1005, 40; INTEL-1006, 14-15.) A DEV in ACTIVE mode “listen[s] to every beacon.” (INTEL-1005, 40.) The APS mode “offers the best power saving by giving up synchronization with the rest of the piconet” and therefore the “DEV simply stops listening to beacons.” (*Id.*, 41.) Synchronized power save (SPS) is a “power-save mode in which devices (DEVs) wake up regularly for the same beacon, called wake beacons, which occur at regular intervals, e.g., every eight superframes.” (*Id.*, 303.) There are two types of SPS modes defined in IEEE 802.15.3: DPS and PSPS. (*Id.*)

54. In the APS mode, the “DEV simply stops listening to beacons.” (*Id.*, 41.) “The only responsibility that a DEV in APS mode has is to send a frame to the

PNC at least once every association timeout period (ATP) in order to maintain its status as being associated with the piconet.” (*Id.*)

55. DSPS mode “provides a method by which DEVs that share common requirements for power savings are able to wake up at the same time to communicate.” (INTEL-1005, 118.) After a DEV “has joined a DSPS set,” “it switches between DSPS and ACTIVE mode depending on the type of traffic that it is handling.” (*Id.*, 118, 42 (describing the process for joining a power save group).) Figure 3-6 of Gilb “shows the wake beacons and sub-rate allocation for a DSPS DEV that has a Wake Beacon Interval of 4 (i.e., it is awake every 4th beacon).” (*Id.*, 42.)

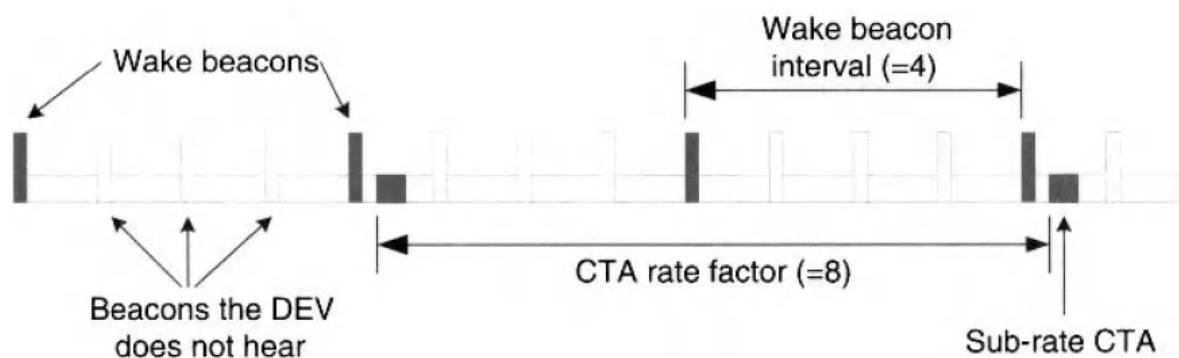


Figure 3–6: Wake beacons and Wake Beacon Interval for a DSPS DEV

56. The primary goal of PSPS mode is “ensuring that DEVs are awake for system changes and announcements.” (INTEL-1005, 43.) “The DEVs in PSPS mode wake up at a time specified in the PS Status IE for the PSPS set (i.e., set 1).” (*Id.*) The PNC, and not the DEVs, chooses the interval between wake beacons.

(*Id.*) The beacon when the PSPS DEVs are required to be in the AWAKE state “is called the system wake beacon.” (*Id.*)

57. A device informs the network of its PM mode through the PM Mode Change command, illustrated in Figure 88 below from the IEEE 802.15.3 standard. (*Id.*, 110-11.) The PM mode field is set to indicate whether the device is in active mode (0), APS mode (1), or SPS mode (2). (INTEL-1006, 148.) For example, a device entering SPS mode sends a PM Change command with field set to “2.” In this way, the PNC has knowledge of the current PM mode of each DEV when allocating CTAs for a superframe.

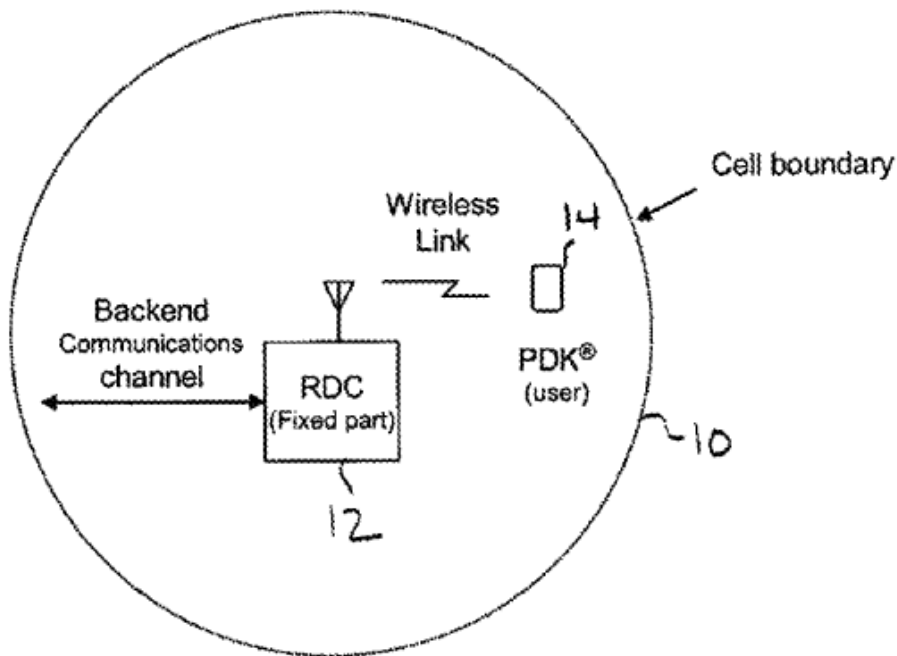
octets: 1	2	2
PM mode	Length (=1)	Command type

Figure 88—PM mode change command format

B. '129 Patent Overview

58. The '129 patent describes operation of its technique in an exemplary system, illustrated in Figure 1 (below). The system includes a device that may serve as a gatekeeper, referred to as a Reader Decoder Circuit (RDC), and a user device, referred to as a Personal Digital Key (PDK). (INTEL-1001, 4:31-33, 4:52-55, 5:21-22, 7:2-3, Figure 1.) The “cell” is defined by the “wireless coverage boundary” of the RDC. (*Id.*, 5:23-24.) The RDC “is a device that can wirelessly

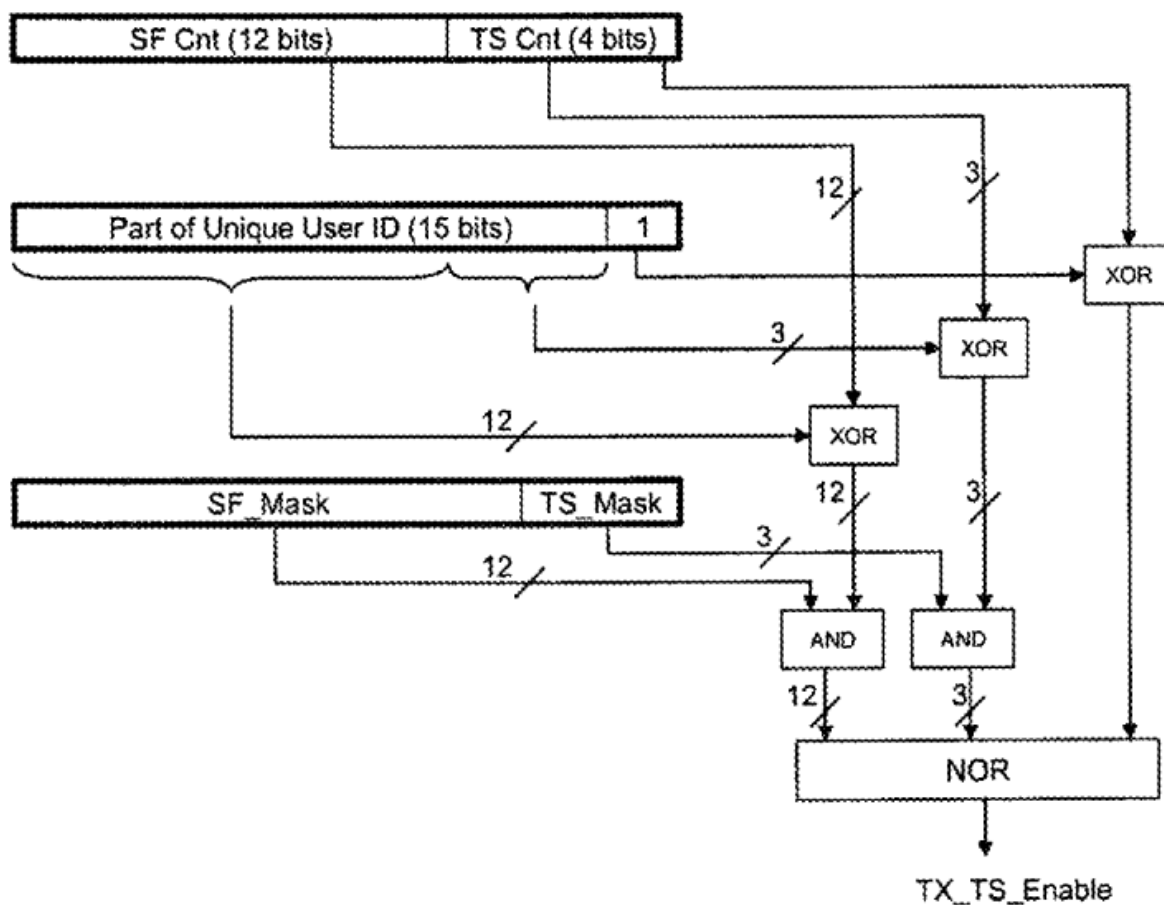
interact with a PDK to link the PDK user with various applications, assets, and/or services.” (*Id.*, 4:50-52.)



'129 Patent, Figure 1

59. The system of the '129 patent “rel[ies], or at least partly [is] based, on an IEEE 802.15.4 protocol” for communication between the devices. (INTEL-1001, 11:5-7.) As part of the system, the RDC “generates and wirelessly broadcasts synchronization information to the client devices, where the synchronization information contains individual masks to be applied to bit fields of individual client devices, where said time slots are determined in accordance with the masked bit fields.” (*Id.*, Abstract.)

60. Figure 18, reproduced below, shows the “timeslot enable operation” using bitmasks. (*Id.*, 2:65-67.) As described in the ’129 patent, the “mask may be used over the superframe and timeslot counts and service provider’s PDK ID to determine the superframe and timeslot the PDK is active on in the framing structure.” (*Id.*, 15:40-43.) That is, the time slot assigned to a DEV is based on comparing its ID to the unmasked bits in the superframe and timeslot count.



'129 Patent, Figure 18

61. The '129 patent mentions that in an example, “there may be multiple client devices (e.g., PDKs) in proximity of a particular fixed reader device (e.g., an RDC).” (INTEL-1001, 16:4-6.) In this example, certain “client devices may be afforded some level of priority, in which case the masks would be set accordingly.” (*Id.*, 16:13-15.) “For example, masks may be set according to a class of a user of a PDK or to a class of the PDK itself.” (*Id.*, 16:15-17.)

62. “To facilitate such differentiation, priority level or tier level data may be present ... when setting a mask for a particular client device or group thereof” to provide “for dynamic real-time tiered client access.” (*Id.*, 16:16-21.)

C. Prosecution History

63. The '129 Patent went through a five-year long prosecution involving three non-final rejections and one final rejection. (*See* INTEL-1002.)

D. Level of Ordinary Skill in the Art

64. I understand that certain issues relating to the validity of the '129 patent must be judged from the perspective of a person of ordinary skill in the relevant art, as I discuss below. I have been asked to define the level of a “person of ordinary skill in the art” or “POSITA” at the time the alleged invention was made. In deciding the level of ordinary skill, I have considered the following factors, which I have been informed are relevant to the determination of ordinary skill in the art:

- the level of education and experience of persons working in the field;
- the types of problems encountered in the art;
- the prior art solutions to these problems;
- the rapidity with which innovations are made; and
- the sophistication of the technology.

65. In my opinion, a person of ordinary skill in the art (“POSITA”) at the time of the purported invention described in the ’129 patent would have had at least a master’s degree in electrical engineering or similar discipline, or two years of experience working or conducting research in the field of wireless communication protocols, or an equivalent combination of education and experience. My opinion below explains how a POSITA would have understood the technology described in the references identified in this declaration as of the priority date of the ’129 patent.

E. Claim Construction

66. I understand that “claim construction” is the process of determining a patent claim’s meaning. I understand that the Patent Office applies the same claim construction standard used in district courts which seeks to give claim terms their plain and ordinary meaning to a POSITA at the time of the claimed invention in view of the claims, specification, and prosecution history. I also understand that if

the patent applicant gave a term a special meaning in the specification or during prosecution, then the special meaning should be used.

67. I understand that PO has asserted the '129 patent in co-pending litigation in the United States District Court for the Western District of Texas. I further understand that, though the parties have not completed claim construction proceedings in that action, PO has served infringement contentions in that action. I further understand that PO has provided a List of Claim Constructions in that litigation which I understand is provided as INTEL-1012. I also understand that Petitioner has provided a List of Claim Constructions in that litigation which I understand is provided as INTEL-1013.

68. It is my opinion that the terms “*synchronization information*” and “*class associated with one or more of the [] client device and [a/the] user of the [] client device*” require construction. I further note below that the term “*time slot*” is defined in the '129 patent's specification but a construction is not required because the challenged claims are invalid under any reasonable interpretation of that term.

1. “synchronization information”

69. All claims recite “*synchronization information*” used to determine or assign time slots. It is my opinion that the proper construction for the term “*synchronization information*” is “information that contains individual bit masks to be applied to bit fields of individual client devices.”

70. The specification and the prosecution history support this interpretation of the term “*synchronization information*.” The Abstract of the ’129 patent defines “*synchronization information*” as follows: “the [claimed] system generates and wirelessly broadcasts synchronization information to the client devices, **where the synchronization information contains individual masks to be applied to bit fields of individual client devices.**” (INTEL-1001, Abstract.)

71. The ’129 patent’s claims and specification confirm the Abstract’s definition. The claims state that “*synchronization information*” is used to “determine[]” or “assign[]” “time slots” during which client devices wirelessly communicate. (*Id.*, claims 1, 8, 12, 16, 18.) The only method the specification discloses for determining or assigning time slots is using masks. (*Id.*, 15:52-16:3 (“by reserving time slots for both client device transmission and reception (based on masks established by the network), client transmission and reception time slots may be efficiently coordinated”), 15:8-11, 15:33-38, 15:39-51, 16:4-20, 16:17-20, 19:26-32, 19:33-44, 20:1-5.)

72. I have reviewed the prosecution history of the ’129 patent. In my opinion, the prosecution history further confirms this proposed construction. During prosecution, in an Office Action dated July 7, 2011, the Examiner rejected PO’s claims under 35 U.S.C. §112, finding no support in the specification for how a time slot is determined according to class. (INTEL-1002, 356.) To overcome the

rejection, PO represented that “[a] mask is set according to the class” and “**the mask sets the times or time slot.**” (*Id.*, 391.)

73. I understand that in the co-pending litigation, PO proposed a construction of “*synchronization information*” to mean any “information assigning a time slot”—even if it does not include masks. (*See* INTEL-1012, 1.) I note that PO’s proposed construction is contrary to the specification and prosecution history which I discussed above.

74. As I discuss below, the challenged claims are invalid under the proper construction (“information that contains individual bit masks to be applied to bit fields of individual client devices”) as well as under PO’s overbroad construction.

2. “class associated with one or more of the [] client device and [a/the] user of the [] client device”

75. Each challenged independent claim recites the “*class associated with one or more of the [] client device and [a/the] user of the [] client device.*” Further, all challenged claims require time slots set according to “*priority level data*” associated with a “class” that is “*associated with one or more of the [] client device and [a/the] user of the client device.*” For purposes of this discussion, I refer to this as the “*class associated with [device/user]*” term. It is my opinion that this term should be construed as “plain and ordinary meaning in which the class is associated with the client device or user of the client device, not data items or network characteristics.”

76. The prosecution history supports this construction. In the September 29, 2010 Office Action, the Examiner rejected all pending claims over U.S. Patent Publication No. 2006/0205408 to Nakagawa (“Nakagawa”; INTEL-1031), alone and in combination with other art. (INTEL-1002, 267-79.) Nakagawa describes allocating “time slots” using network characteristics—including allocation times slots “based on the traffic and the like.” (INTEL-1031, ¶3.) PO responded by representing that Nakagawa does not disclose the claimed “*class associated with [device/user]*” because “time slots in Nakagawa are not set by a first class or by a second class **but are allocated based on network characteristics.**” (INTEL-1002, 302, 303 (“Nakagawa does not disclose [the limitation] as claimed, but rather determines time slots based on characteristics of a mobile communications network.”).) The Examiner appeared to accept PO’s representation that the claimed class is not network characteristics. (*Id.*, 360.)

77. The Examiner did, however, subsequently reject all pending claims on the grounds that U.S. Patent No. 7,209,955 to Major (“Major”; INTEL-1014) disclosed the claimed class in the July 7, 2011 Office Action. (INTEL-1002, 358-73.) Major describes a “priority ranking” for “data items” sent from a host to a client device, including “E-mail messages, calendar events, meeting notifications, address entries, journal entries, personal reminders, instant email notifications, etc.” (INTEL-1014, 4:63-5:15.) PO again distinguished its claimed class from

Major by asserting that: “Major does not disclose ‘class’ as recited in the claim. **In Major, class is associated with data items**; in the Applicants’ specification, class is associated with one or more of the client device and the user of the client device.” (INTEL-1002, 367-68.) The Examiner accepted PO’s arguments and subsequently allowed the claims. (*Id.*, 411-22, 457.)

78. These statements indicate that PO intended to exclude class associated with “data items” and “network characteristics” from the “*class associated with [device/user]*” term. This exclusion is consistent with the specification, which exclusively describes the “*class*” as being associated with a user or device, but never with data items or network characteristics. I reproduce the limited mentions of “*class*” from the specification below:

Thus, in other words, by reserving time slots for both client device transmission and reception (based on masks established by the network), client transmission and reception time slots may be efficiently coordinated to reduce collision likelihood and allow for tiered client access, assignment of specific classes, and/or targeting an individual user for preferential, non-contended system access. Further, in one or more embodiments, bit masks may be changed to include or exclude specific users (or **classes of users**). Still further, in one or more embodiments, bit masks may be changed to dynamically alter access to the network by users or **classes of users** as traffic load on the network changes. Moreover, it is noted that once a specific client exits the network, previously reserved time slots of that client may be reassigned to one or more other client devices in the network.

To provide an example, there may be multiple client devices (e.g., PDKs) in proximity of a particular fixed reader device (e.g., an RDC). Each of these client devices, other than providing a location

response, may request some data exchange with the reader device in order carry out a secure transaction. In an effort to reduce collision and coordinate the time slots that each client device “talks” with the reader device, a mask may be communicated to each client device to set the times at which the client device is to communicate with the reader device. Further, certain ones of the client devices may be afforded some level of priority, in which case the masks would be set accordingly. For example, masks may be set according to a **class of a user of a PDK or to a class of the PDK itself**. To facilitate such differentiation, priority level or tier level data may be present in an RDC or CRDC to be used when setting a mask for a particular client device or group thereof. Thus, in such a manner, there is provided a technique for dynamic real-time tiered client access. Moreover, it is noted that in one or more embodiments, a CSMA-CA mechanism may be implemented as a backup approach to facilitate data exchange.

(INTEL-1001, 15:58-16:3, 16:15-20.)

79. I understand that in the co-pending district court litigation, PO proposes “plain and ordinary meaning” for the “class” term. (INTEL-1012, 1.) I further understand that in its infringement contentions, PO is interpreting the “*class associated with [device/user]*” term to cover data and network characteristics. (INTEL-1015, 7, 10-14.) In my opinion, this interpretation cannot be squared with the ’129 patent’s intrinsic record, which associates the “*class*” only with a user or a device, not with data items or network characteristics. Regardless, as I discuss below, the challenged claims are invalid even under PO’s overbroad interpretation.

3. “*time slot*” (all claims)

80. All claims recite a “*time slot*” during which a client device communicates with a reader or network device. I note that the specification uses

both the “timeslot” and “time slot” interchangeably. For purposes of this declaration, I use the spelling “timeslot.” The specification states that “a ‘**timeslot**’ is defined as a period of time that information is communicated between two devices.” (INTEL-1001, 11:7-9.) “*Time slot*” should be therefore be construed according to that definition. I understand that PO seeks an alternative construction of “*timeslot*” as “a set period of time for communicating – i.e., sending and/or receiving data.” (INTEL-1012, 2.) The prior art meets this term under any reasonable construction of the term.

IV. Ground 1: The Combination of Gilb and 802.15.3 Renders Claims 1-2, 5-7, 16, and 18 Obvious.

81. The combination of Gilb and 802.15.3 renders claims 1, 2, 5-7, 16, and 18 obvious only under PO’s broad interpretations of the “*synchronization information*” and “*class associated with [device/user]*” terms. (§§III.E.1-2.)

A. Overview of the Combination

1. Overview of Gilb

82. “Wireless Multimedia: A Guide to the IEEE 802.15.3 Standard” by Gilb (“Gilb”) is a publication by the IEEE Standards Information Network which is a publishing entity within the IEEE Standards Department. (See INTEL-1021, 1.) The book was offered for sale by IEEE at least by May of 2004. (See *id.*)

83. James Gilb, the author of Gilb, was a member of the IEEE 802.15 Working Group and contributor to the 802.15.3 standard. (INTEL-1005, Cover, vii;

INTEL-1006, iv-v.) Gilb discloses an “introduction and explanation of the IEEE 802.15.3” standard and is “intended for people who want to learn more about wireless multimedia solutions based on...802.15.3.” (INTEL-1005, xv, 1.) I provided an overview of the IEEE 802.15.3 standard, citing to portions of Gilb in §III.A.2.a.

2. IEEE 802.15.3 Standard (2003)

a) Overview

84. The IEEE 802.15.3 standard (hereinafter “802.15.3”) defines the “PHY and MAC specifications for high data rate wireless connectivity with fixed, portable and moving devices within or entering a personal operating space.” (INTEL-1006, 1.) In this declaration, I use the term “IEEE 802.15.3” when referring to the protocol and “802.15.3” when referring to the standard document. I provided an overview of the IEEE 802.15.3 standard, citing to portions of 802.15.3, in §III.A.2.a.

b) Public Availability of 802.15.3

85. The IEEE-SA generates standards using processes that are recognized by the International Organization for Standardization (ISO) as meeting typical standards development processes. IEEE-SA members can participate in what used to be called Sponsor Ballots (now called SA Ballots) which is the review process for draft standards that have passed from the Task Group to the Working Group to

the Sponsor Executive Committee (SEC). I have participated in several Sponsor/SA ballots over the last 14 years as an IEEE-SA member.

86. The 802.15 Working Group operates indirectly under the IEEE-SA (with the IEEE 802 SEC providing overall oversight of all 802 Working Groups), and includes several Task Groups, each of which is typically responsible for generating a single amendment which will ultimately become part of a baseline IEEE standard. The Task Groups generate draft amendments for approval by the Working Group, which the Working Group presents (indirectly) for approval by IEEE-SA using the Sponsor/SA Ballot process after approval by the IEEE 802 SEC. Task Group 3 (TG3), which was formed in March 2000, was one task group that operated under the 802.15 Working Group.

87. During the 2000 to 2003 timeframe, I was active as a member of the IEEE 802.15 Working Group, and attended every 802 meeting (which included meetings of the IEEE 802.11, 802.15, 802.18, and 802.19 Working Groups).

88. I reviewed and voted on the 802.15.3-2003 standard as a member of the SEC in 2003. The 802.15.3-2003 standard was approved in September 2003.

89. After IEEE-SA approved a final standard for publication (after the draft passed Sponsor/SA Ballot), the standard would be copy-edited by the IEEE-SA editorial department. The purpose of this process is to catch editorial (e.g., stylistic, grammatical, linguistic, and syntactic) errors not caught by the balloting

participants. During this process, the copy editor engages with the Task Group editor to ensure that no changes have any technical impact.

90. After publication, IEEE standards are made available to members of the IEEE and for purchase by any member of the public. The IEEE-SA makes ratified standards available for no cost to the public for a limited period of time through the Get IEEE 802 program, after which they are still available to the public, but there may be a fee to download. In September 2003, when the IEEE 802.15.3-2003 standard was published, Get IEEE 802 was a pilot program. The IEEE website at that time provided the following description of the Get IEEE 802 program:

The *Get IEEE 802*TM program makes IEEE 802® standards available at no charge in PDF format thanks to the sponsors listed to the right. This **pilot program** grants public access to view and download **current** individual IEEE Local and Metropolitan Area Network standards at no charge.

- New IEEE 802® standards are **included in the program after they have been published in PDF for six months.**
- All documents available in the *Get IEEE 802*TM program will remain in the program until they are replaced in the program by a superseding document or are withdrawn.
- Superseded, Drafts, and Withdrawn documents can be purchased by visiting the IEEE Online Catalog & Store. or by subscribing to IEEE LAN/MAN plus Drafts Standards Online Subscription.

This pilot program will be reviewed periodically for continuance. Click [here](#) for more information about how you and/or your organization can help keep this pilot program alive.

To select any of the available standards, click [here](#) for the index to the standards. You must accept the Terms and Conditions. Upon accepting, you will be able to download the standard(s). If you encounter a problem downloading a standard, try configuring Adobe Acrobat as a helper not a plug-in (see instructions below), or upgrade to Adobe Acrobat 5.0 or higher.

See INTEL-1022.

91. Six months after the IEEE 803.15.3-2003 standard was published (September 29, 2003), and by at least April 14, 2004 (INTEL-1023), a visitor to the IEEE website would have been able to access the IEEE 802.15.3-2003 standard for free via the Get IEEE 802 download page. This page merely required the visitor to identify whether they were a student, standards developer, public network service provider, etc. in order to download the document. (*See* INTEL-1024.)

92. The Get IEEE program has existed at least since April 2003. (*See* INTEL-1025, 2.) According to a report to the IEEE 802 Sponsor Executive Committee by Jonathan Goldberg of IEEE staff, over 7.3 million documents were downloaded by the public during the period from April 2003 to September 2018 as part of the Get IEEE 802 program, with over 2.6 million downloads by academia. (*Id.*, 2-3.)

93. The Get IEEE 802 program (part of the overall IEEE Get program for all standards, not just IEEE 802) is one of four ways to access standards and standards in development: Standards Store; IEEE Xplore Digital Library; IEEE Standards Reading Room; and the IEEE Get Program. All IEEE standards are available for anyone in the public to obtain, either for free via the Get IEEE 802 program or for purchase through the Standards Store. Anyone can create an account in IEEE Xplore and view a copy of any of the published standards at no charge via the IEEE Standards Reading Room. The Reading Room allows view-only privileges to the general public; institutions that have an IEEE-SA corporate or university account allow their users to download documents for free, even ones that are no longer free under the Get IEEE 802 program. Hence, millions of university students and company employees have free access to all versions of IEEE Standards. Anyone else in the general public can purchase any IEEE standard after it transitions out of the Get IEEE 802 program.

94. As further evidence that 802.15.3 was publicly available by January 6, 2006, 802.15.3 was cited in numerous patent publications and articles published before January 6, 2006. I provide a sampling of such publications and articles below.

- U.S. Patent Publication 2004/0025179 to Russ, published February 5, 2004 (INTEL-1026, ¶31)

- U.S. Patent Publication 2005/0113102 to Kwon, published May 26, 2005 (INTEL-1027, e.g., ¶¶7-10)
- U.S. Patent Publication 2005/0265371 to Sharma, published December 1, 2005 (INTEL-1028, e.g., ¶¶11-12)
- “Comparison of IEEE 802.11e and IEEE 802.15.3 MAC” by Wang, et al., published in the Proceedings of the IEEE 6th Circuits and Systems Symposium on Emerging Technologies: Frontiers of Mobile and Wireless Communication (2004 and uploaded to IEEE Xplore on August 16, 2004) (INTEL-1029)
- “Intra-superframe power management for IEEE 802.15.3 WPAN”, published in IEEE Communications Letters (Volume 9, Issue 3, March 2005) (INTEL-1030)

3. Motivation to Combine

95. Gilb and 802.15.3 are in the same field as the challenged claims of the ’129 patent (network, encompassing wireless, communications). Gilb and 802.15.3 are also reasonably pertinent to the problem addressed by the ’129 patent (how to structure communications between network and client devices). (INTEL-1005, 25-28 (describing communication between DEVs in a piconet); INTEL-1006, 8 (describing communication between DEVs in a piconet); INTEL-1001, Abstract.)

96. A POSITA would have been motivated to combine Gilb with the teachings of 802.15.3. First, Gilb explicitly motivates a POSITA to look to 802.15.3. Gilb is titled “A Guide to the IEEE 802.15.3 Standard.” (INTEL-1005, Title, 3 (“IEEE Std 802.15.3, which is the subject of this book”).) Gilb states that it provides an “introduction and explanation of the IEEE 802.15.3” standard and is “intended for people who want to learn more about wireless multimedia solutions

based on...802.15.3.” (*Id.*, xv, 1.) Gilb also cites throughout to specific clauses of the standard. (*See, e.g., id.*, 260 (“In order to create an interoperable, 802.15.3-compliant DEV, the implementer only needs to refer to Clause 7, Clause 8, Clause 9 ..., and Clause 11”), 297.) Gilb also cites to the standard as [B16] in its glossary. A POSITA would have further recognized Gilb as a reliable guide to 802.15.3 as its author, Dr. Gilb, was listed in 802.15.3 as having been involved in drafting 802.15.3. (INTEL-1006, iv.) As a drafter of the standard, Dr. Gilb was involved in the discussions that led to the standard, and understood the standard itself.

97. Second, a POSITA reading Gilb would have looked to the standard (INTEL-1006) to provide further detail and clarification on how to implement IEEE 802.15.3 applications. Generally, a standard provides a list of requirements that a device or a network must meet in order to be compatible with other devices and networks that are using a particular protocol. The standard itself does not provide details of implementations of the standard, nor does it generally provide descriptions of compliant devices. Gilb “provides an **introduction** and **explanation** of the IEEE 802.15.3TM wireless personal area networks (WPANs) standard” and is purposed to “[c]larify IEEE Std 802.15.3 for individuals who are implementing compliant devices” and “[s]how how IEEE Std 802.15.3 can be used to develop wireless multimedia applications.” (INTEL-1005, 1.) Gilb recognizes, however, that portions “provide[] a **high-level overview** of the standard.” (*Id.*, xv.)

Gilb thus explicitly motivates a POSITA to combine further detail and clarification from 802.15.3 with the introductory, explanatory, and high-level overview teachings of Gilb. For example, 802.15.3 provides the specific formats of IEEE 802.15.3 messages disclosed in Gilb, including, e.g., the format of the beacon and the CTA IE within the beacon. (*See, e.g., supra* §III.A.2.a.iv.)

98. Third, the combination of Gilb and 802.15.3 applies a known technique (802.15.3's wireless protocol) to provide details of Gilb's 802.15.3-compliant system. As discussed above, Gilb "[s]how[s] how IEEE Std 802.15.3 can be used to develop wireless multimedia applications." (INTEL-1005, 1.) Gilb therefore describes systems that are not just similar to 802.15.3, but rather, the described systems *are* 802.15.3 systems. Thus, a POSITA would apply the known techniques in 802.15.3 to add further detail and clarification and therefore improve the 802.15.3 systems that Gilb describes.

99. A POSITA would have had a reasonable expectation of success combining the teachings of Gilb and 802.15.3, and the results of the combination would have been predictable because, as discussed above, Gilb is designed as a companion to 802.15.3.

B. Independent Claims

100. Ground 1 challenges independent claims 1, 16, and 18. I discuss independent claim 16 first, then proceed to address independent claims 18 and 1 respectively.

1. Independent Claim 16

101. Claim 16 is reproduced below with applicable labels:

[16P] A system, comprising:

[16A] a network device configured to wirelessly broadcast synchronization information; and

[16B] a portable client device configured to wirelessly receive the synchronization information,

[16C] the received synchronization information comprising information assigning a specific time slot during which the client device can receive data from the network device,

[16D] the time slot being determined according to a priority level data associated with a class,

[16E] the class associated with the one or more of the portable client device and the user of the portable client device.

a) Preamble [16P]

102. The combination of Gilb and 802.15.3 discloses “*a system*” [16P], the IEEE 802.15.3 piconet, which is “a wireless ad hoc data communications system which allows a number of independent data devices (DEVs) to communicate with each other.” (INTEL-1006, 8; INTEL-1005, Figure 3-1 (below), 25.)

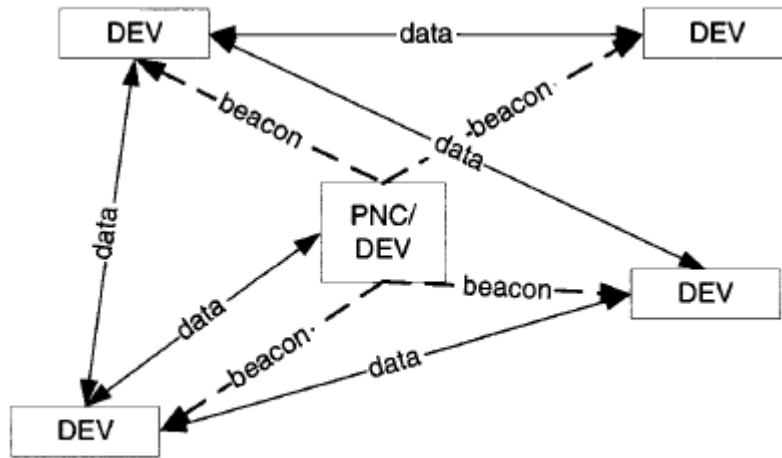
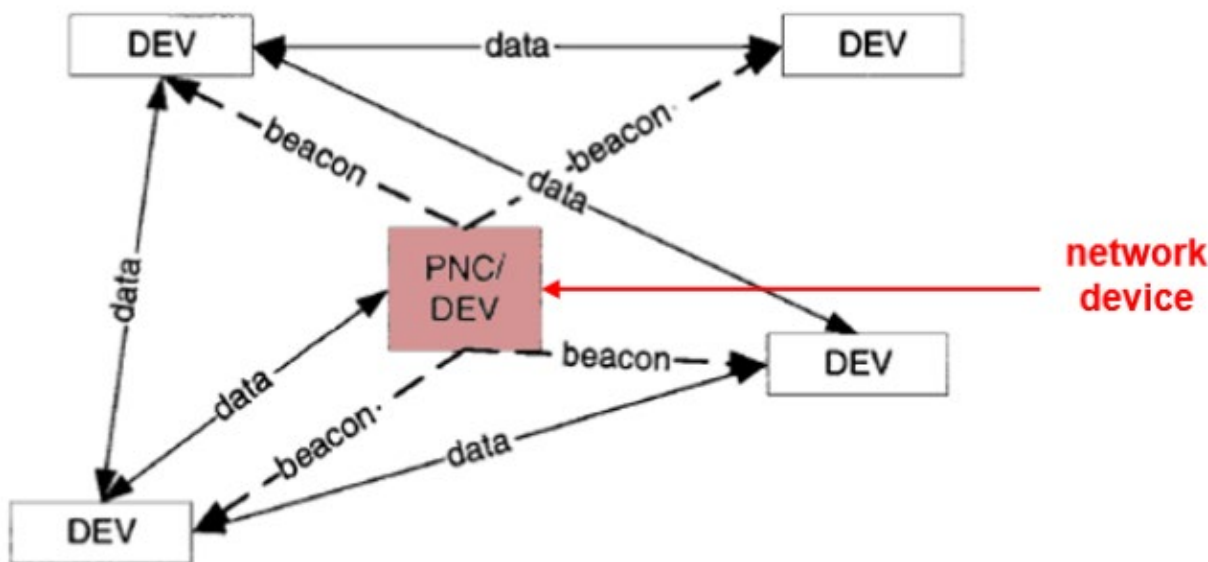


Figure 3–1: Elements of an 802.15.3 piconet

b) Limitation 16[A]

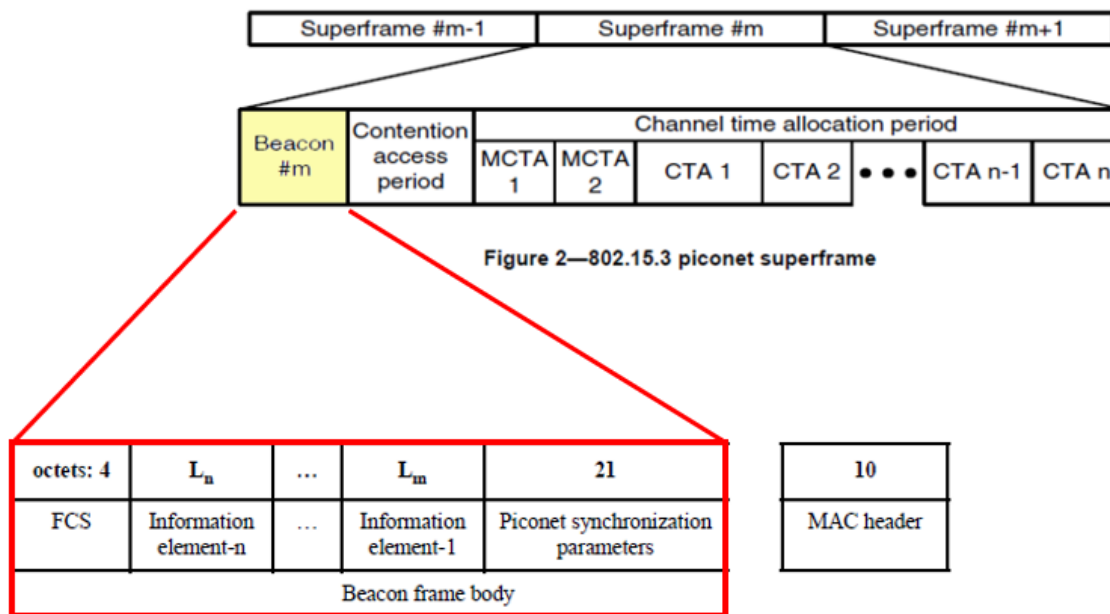
103. The combination of Gilb and 802.15.3 provides “a network device configured to wirelessly broadcast synchronization information” [16A] under PO’s interpretation of “synchronization information.”

104. The two key elements of the 802.15.3 piconet are “the piconet coordinator (PNC) and the device (DEV).” (INTEL-1005, 25; INTEL-1006, 8 (describing that the “basic component” of the 802.15.3 piconet is “the DEV” and one DEV in the piconet “is required to assume the role of the piconet coordinator (PNC) of the piconet”).) The PNC/DEV (shaded red) is the recited “network device” within the wireless piconet. (INTEL-1005, 300 (defining “device (DEV)”; INTEL-1006, 8 (“A piconet is a wireless ad hoc communications system which allows a number of independent data devices (DEVs) to communicate with each other.”).)



Gilb, Annotated Figure 3-1

105. The PNC/DEV “operates as the arbitrator in assigning channel time” and “provides the timing reference for the piconet.” (INTEL-1005, 26.) It partially fulfills these roles through the use of the “beacon” which is part of the IEEE 802.15.3 superframe. (*Id.*; *supra* §III.A.2.a (background).) A PNC sends the beacon “at a regular interval such that the superframe duration is normally constant.” (INTEL-1005, 32, 33, Figure 3-5; *see also* INTEL-1006, 11, Figure 2 (illustrating the IEEE 802.15.3 superframe) (below-top), 108, Figure 11 (illustrating the beacon frame) (below-bottom).) All DEVs in the piconet “acquire synchronization through beacons from the PNC.” (INTEL-1006, 193.)



106. Gilb describes use of an IEEE 802.15.3 beacon, but does not provide details of the beacon frame format. A POSITA would have therefore been motivated to consult 802.15.3 for the reasons discussed in §IV.A.3 which provides these details. As specified in 802.15.3, the beacon frame contains piconet synchronization parameters including the “superframe duration,” which “contains the duration of the current superframe.” (INTEL-1006, 11, 109, Figure 11 (108, above), Figure 12 (108, below).) The superframe duration allows “all of the DEVs” to “know when the next beacon will occur.” (INTEL-1005, 33.) The CAP End Time “specifies the end of the CAP interval for the current superframe.” (INTEL-1006, 109.) The time token “contains a 48-bit roll-over counter which is incremented in each beacon.” (*Id.*, 108.)

octets: 8	1	1	1	2	2	6
PNC address	PNC response	Piconet mode	Max TX power Level	CAP end time	Superframe duration	Time token

Figure 12—Piconet synchronization parameters field format

107. The beacon’s piconet synchronization parameters field “contains the information necessary to time-synchronize the DEVs in the piconet.” (*Id.*, 191.) Further, “[a]ll DEVs within a single piconet shall be synchronized to the PNC’s clock”. (*Id.* Figure 4-3 from Gilb illustrates the timing facilitated through the piconet synchronization parameters. (INTEL-1005, 51-52; INTEL-1006, 108-110.)

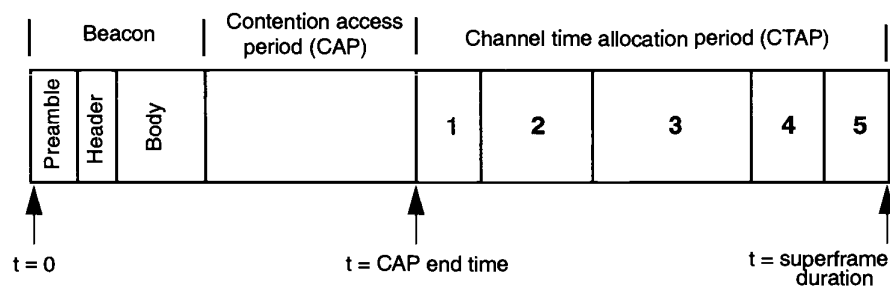
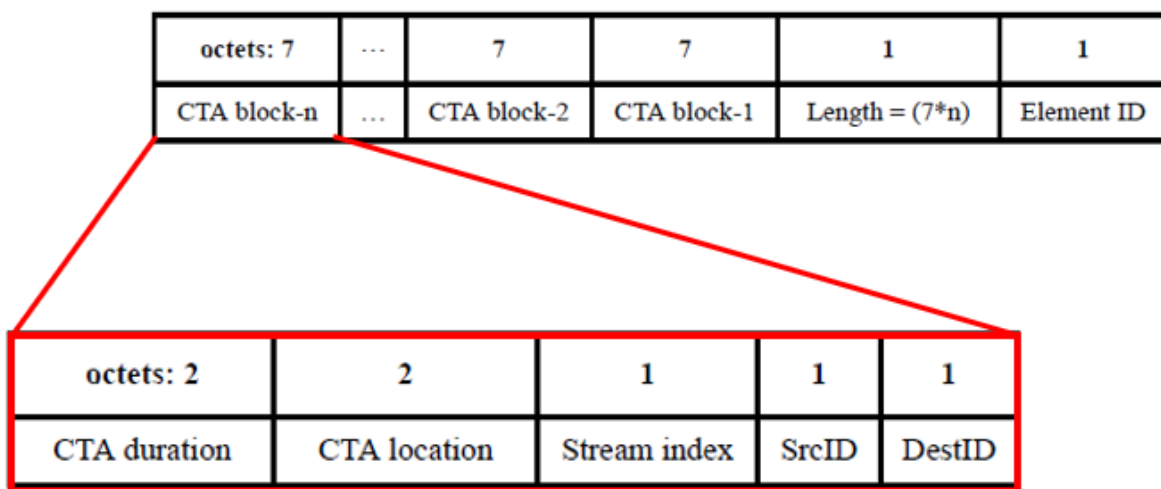


Figure 4-3: Piconet timing relative to the beacon

108. The beacon also includes one or more “information elements (IEs).” (INTEL-1005, 53; INTEL-1006, 108, Figure 11 (above).) One IE included in a beacon is the channel time allocation IE (“CTA IE”), providing the allocations of the CTAs in the CTAP portion of the superframe. (*See* INTEL-1005, 53 (“The PNC **will always send the CTA IE**, the BSID IE, and the Parent Piconet IE, if present, in the beacon frame”), 56, 103-104; *see also* INTEL-1006, 116, 191, Table 48.) The PNC communicates allocations of CTAs to the DEVs in the piconet through

the CTA IE. (INTEL-1005, 56; *see also supra* §III.A.2.a.) A CTA IE, illustrated below, includes one or more CTA blocks, “each of which has the **source**, **destination**, stream index, start time, and duration of the CTA.” (INTEL-1005, 56-57; INTEL-1006, 117, Figure 25 (CTA IE format), Figure 26 (CTA block format).) Gilb does not provide the format of either the CTA IE or CTA block. This information is provided by 802.15.3.



802.15.3, Figure 25 (top), Figure 26 (bottom)

109. Each CTA is a “*time slot*” within the CTAP of the superframe, under any reasonable interpretation of the term. (*Supra* §III.E.3 (presenting claim construction of “*time slot*”); §III.A.2.a (background of protocol); INTEL-1005, 33 (“the access method for CTAs is **time division**”), 158 (“Because a CTA is a **TDMA allocation** ...”), 299-300 (“[c]hannel time allocations use **time division**

multiple access (TDMA)”); *see also*, INTEL-1016, ¶11 (referring to IEEE 802.15.3 CTAs as “time slots”).)

110. The CTA IE is used by piconet DEVs to determine when to start transmission (if identified as a source) or to listen for incoming transmissions (if identified as a destination). (*See* INTEL-1005, 40 (“[i]f the DEV sees that it is not the source or destination of a particular CTA, it is not required to have its receiver active for that duration”), 59, 101; INTEL-1006, 178, 192 (“All of the DEVs that are associated shall use the beacon start time, CAP end time and the CTA IEs contained in the beacon to start their transmissions”).)

111. The 802.15.3 beacon provides CTA (“*time slot*”) allocations for source and destination DEVs and provides information about the frame structure and timing for all piconet DEVs. The beacon therefore is or at least includes “*synchronization information*” under PO’s interpretation of the term which I understand to be information assigning a time slot. (*See* INTEL-1005, 26; *supra* §III.E.1 (claim construction).)

112. The PNC “*wirelessly broadcasts*” the beacon to all DEVs in the piconet as shown in Gilb’s Figure 3-1 (above). (*See, e.g.*, INTEL-1005, 25 (“extent of the piconet is determined by the ability of DEVs to hear the beacon transmitted by the PNC”), 31 (explaining that a PNC starts a “piconet by **broadcasting** a beacon”), 32 (piconet “said to be in operation as long as the PNC is sending

beacons”), 56-57; INTEL-1006, Title (“**Wireless** [MAC] and [PHY] for High Rate **Wireless** Personal Area Networks (WPAN)s”), 1 (“This standard defines the PHY and MAC specifications for high data rate **wireless** connectivity . . .”), 4 (defining “piconet coordinator” as providing services such as “synchronization . . . via the wireless medium”), 8 (“A piconet is a **wireless** ad hoc data communications system which allows a number of independent data devices (DEVs) to communicate with each other.”), 151 (“the PNC [] shall commence **broadcasting** its beacon once every superframe duration”), 171 (“All the CTAs for the current superframe are **broadcast** in the beacon.”).)

c) Claim Limitation [16B]

113. The combination of Gilb and 802.15.3 discloses “*a portable client device configured to wirelessly receive the synchronization information*” [16B] under PO’s interpretation of “*synchronization information*.”

114. As described above, the two key elements of the 802.15.3 piconet are “the piconet coordinator (PNC) and **the device (DEV)**.” (INTEL-1005, 25; INTEL-1006, 8.) As noted by Gilb, IEEE 802.15.3 is a wireless protocol “designed specifically to address the needs of high-speed, low-cost **portable** multimedia devices.” (INTEL-1005, xv, 13 (“only 802.15.3 is able to address all of the requirements for **portable, wireless** multimedia devices”); *see also* INTEL-1006, 1

(“This standard defines the PHY and MAC specifications for high data rate **wireless** connectivity with fixed, **portable** and moving **devices**”).)

115. Gilb provides multiple examples of portable devices including digital cameras, headphones, wireless microphones, and wireless game controllers.

(INTEL-1005, 14-19.) Gilb further provides the following examples:

- Still image applications: “still image transfer from a digital camera to a photo kiosk” (*Id.*, 14)
- “With an IEEE Std 802.15.3 wireless link, the user can easily send the pictures to the printer.” (*Id.*, 15)
- Audio telephony applications: “audio applications are those that transmit voice between two parties in a manner similar to the telephone system.” (*Id.*, 15-16)
- High quality audio applications: digital audio players, headphones, speakers, wireless microphones (*Id.*, 17-18)
- Gaming applications: “The most obvious application of wireless connectivity in video games is to remove the wires that connect the controllers to the game console ... The data transfers are bidirectional as well because game controllers often implement physical feedback mechanisms to enhance the gaming experience.” (*Id.*, 18)
- “Game consoles now have the ability to access the Internet. In this case, the console could act as the wireless router for the house, distributing information to wireless portable devices such as web pads. The game console could also be used to play music that is sent wirelessly to speakers or headphones.” (*Id.*)

These devices, particularly digital cameras, headphones, wireless microphones and wireless game controllers are relatively small, use batteries and are not connected

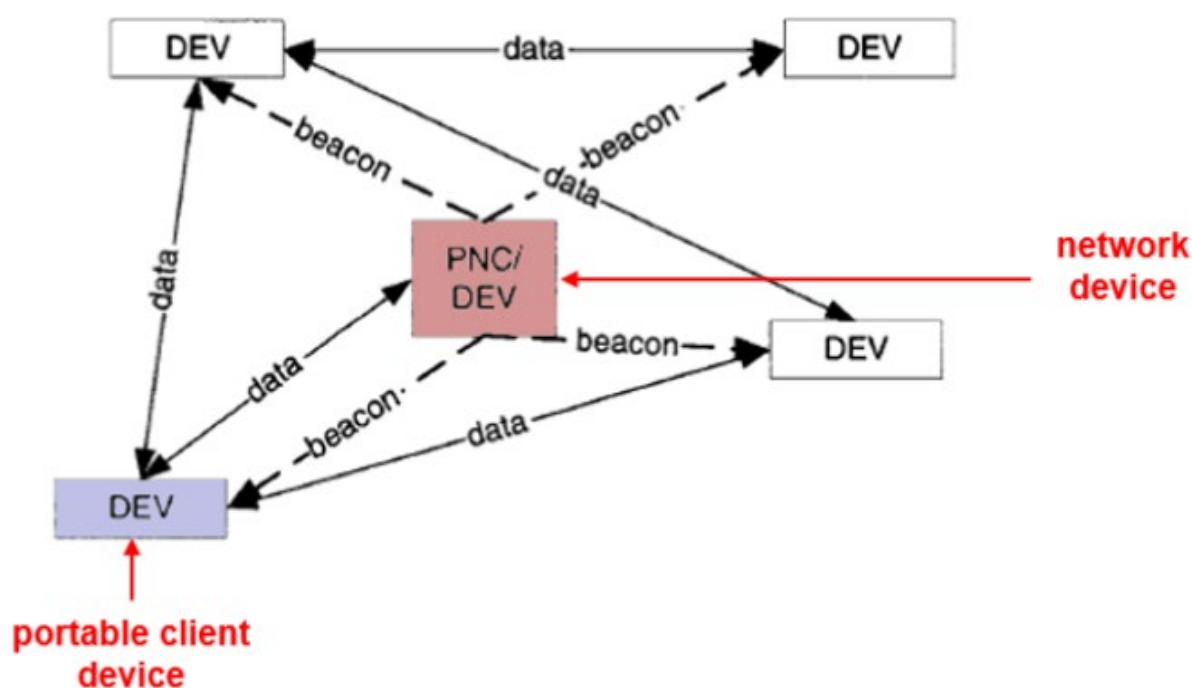
to other devices using wires. Thus, they are described as “*portable*” devices. IEEE 802.15.3 therefore supports “*portable*” devices in the piconet.

116. Although neither Gilb nor 802.15.3 refers to the DEVs as “*client devices*”, a POSITA would have understood them to be “*clients*” consistent with the ’129 patent, which refers generally to devices not acting as a network coordinator as “*client*” devices. (See INTEL-1001, 15:52-55 (referring to PDKs as “client devices” within an “RDC’s wireless coverage area).) I note that this terminology was also used in the field. For example, U.S. Patent Publication No. 2003/0152059 to Odman (“Odman”) describes that “[w]hen the term piconet is used, it refers to a network of devices connected in an ad hoc fashion, having one device act as a coordinator (i.e., it functions as a server) while the other devices (sometimes called stations) follow the time allocation instructions of the coordinator (i.e., they function as clients).” (INTEL-1017, ¶¶9, 22.) Gilb further discloses that the “*client devices*” (DEVs) are not acting as network coordinators (PNC/DEV). (INTEL-1005, 18, 19, 20-21.) The Gilb-802.15.3 combination therefore discloses “*a portable client device*.”

117. As I discussed in §IIIA.2 and is shown in Gilb’s Figure 3-1 below, DEVs in the piconet receive the beacon transmitted by the PNC and use information extracted from the beacon. (*Id.*, 25 (“extent of the piconet is determined by the ability of DEVs to hear the beacon transmitted by the PNC”), 56

(“The CTAs are communicated to the DEVs in the piconet via the CTA IE in the beacon.”); INTEL-1006, 192 (section dedicated to “Beacon reception”).) All piconet DEVs “shall use the beacon start time, CAP end time and the CTA IEs contained in the beacon to start their transmissions.” (INTEL-1006, 192.)

Additionally, DEVs use the “superframe duration and the CAP end time in the beacon ... to accurately mark the beginning and the end of the CTAP.” (*Id.*, 192.)



Gilb, Annotated Figure 3-1

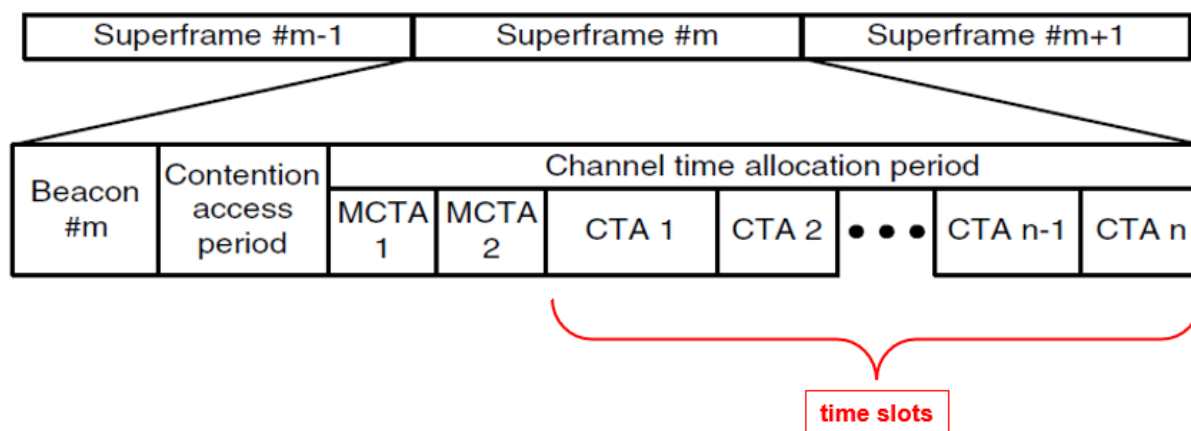
118. Because 802.15.3 is a wireless protocol, the piconet DEVs are “configured to wirelessly receive the synchronization information” [16B] in the beacon transmitted by the PNC under PO’s interpretation of “synchronization information.” (INTEL-1006, 1 (“This standard defines the PHY and MAC

specifications for high data rate **wireless** connectivity . . .”), 3 (“device: an entity that implements an IEEE Std. 802.15.3™-2003 conformant media access control and physical layer interface to the **wireless** medium.”), (“8 (“A piconet is a **wireless** ad hoc data communications system ...”).)

d) Claim Limitation [16C]

119. The combination of Gilb and 802.15.3 discloses “*the received synchronization information comprising information assigning a specific time slot during which the client device can receive data from the network device*” [16C] under PO’s interpretation of “*synchronization information.*”

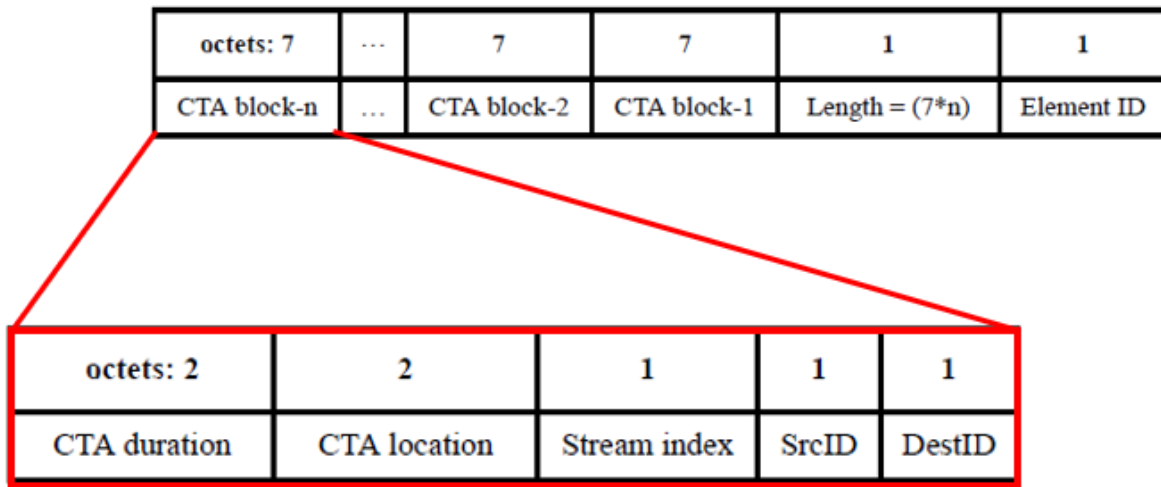
120. The CTAP portion of an IEEE 802.15.3 superframe “is composed of channel time allocations (CTAs).” (INTEL-1006, 11-12, Figure 2 (below).) During the CTAP, “the PNC controls the channel access by **assigning CTAs** to an individual DEV or to a group DEVs with each **CTA having a fixed start time and duration.**” (*Id.*, 169-70.) Each CTA is therefore a “*time slot*” under any reasonable interpretation of the term. (*Supra* §III.E.3; INTEL-1005, 33 (“the access method for CTAs is **time division**”), 158 (“Because a CTA is a **TDMA allocation** ...”), 299-300 (“[c]hannel time allocations use **time division multiple access (TDMA)**”); *see also*, INTEL-1017, ¶11 (referring to IEEE 802.15.3 CTAs as “time slots”).)



802.15.3, Annotated Figure 2

121. The PNC assigns a “*specific time slot*” within the CTAP to a source/destination DEV pair. As discussed in §IV.B.1.b, the beacon includes a CTA IE which communicates the CTA assignments for the superframe to the DEVs in the piconet. (INTEL-1005, 56.) Specifically, the CTA IE, illustrated below, includes one or more CTA blocks, “each of which has the **source, destination, stream index, start time, and duration of the CTA.**” (*Id.*, 56-57; INTEL-1006, 117, Figure 25 (CTA IE format), Figure 26 (CTA block format).) The destination specified in the CTA block “indicates the DEV to which the source DEV may send” frames. (INTEL-1006, 117.) The CTA location field “indicates the start time of the allocation” and the duration “specifies the duration of the CTA.” (*Id.*) The CTA location and duration therefore define the “*specific time slot*” within the CTAP assigned to the source/destination pair of devices. (See INTEL-1005, 32-33

(“[o]nly the DEV that is listed as the source is allowed to transmit in a CTA, and so the access method for CTAs is time division, multiple access (TDMA”).)



802.15.3, Figure 25 (top), Figure 26 (bottom)

122. In IEEE 802.15.3, a DEV (“*client device*”) can receive data from the PNC/DEV (“*network device*”) during a CTA. Gilb explains that a piconet’s “PNC also acts as a DEV in the piconet and is able to communicate with any other DEV in the piconet.” (INTEL-1005, 25, 47-48 (“PNC is also a DEV in the piconet and so it is just as likely to be a source or sink for a data stream as any other DEV in the piconet”); INTEL-1006, 8.) Therefore, the PNC has both a PNC personality (and an associated PNCID) and a DEV personality (and an associated DEVID). (See, e.g., INTEL-1005, 57; see also INTEL-1006, Figure 1 (showing “PNC/DEV”).) This is reflected in Gilb Figure 3-1 (above), which indicates the PNC with the label “PNC/DEV” (shaded red), and shows the PNC/DEV

communicating data with a non-PNC DEV (shaded blue). IEEE 802.15.3 contemplates circumstances where the PNC/DEV is the “source” assigned to a CTA¹ using its DEVID. I discuss some exemplary applications with this configuration in the next paragraphs. Thus, an IEEE 802.15.3 piconet supports assigning a CTA during which the PNC/DEV (“*network device*”) acting in its DEV personality transmits data to a DEV (“*portable client device*”). (INTEL-1006, 117.)

123. Gilb describes various applications having data transmission from a PNC/DEV to a DEV. For example, Gilb explains a game console/router “act[ing] as the wireless router for the house, distributing information to wireless portable devices such as web pads” and “could also be used to play music that is sent wirelessly to speakers or headphones.” (INTEL-1005, 18.) That is, the game console/router communicates with the game controllers for users playing a video game but also provides internet access and video/audio streaming. (*Id.*, 18-19.) In this example, the game console/router is the PNC, because, e.g., it is in the center of the house, or has a higher transmitting power than other devices. (*Id.*, 67.) The game console/router also acts as a DEV, specifically, a source DEV that wirelessly

¹ IEEE 802.15.3 also supports management CTAs (“MCTAs”) during which a PNC, acting in its PNC personality and using its PNCID, is either the source or destination of data. (*See* INTEL-1005, 33-34.)

communicates the audio data to headphones (which is a portable client DEV) in an assigned CTA (a “*time slot*”). Thus, the combination of Gilb and IEEE 802.15.3 discloses “*the received synchronization information [beacon] comprising information [CTA IE] assigning a specific time slot [CTA] during which the client device [DEV] can receive data from the network device [PNC/DEV]*” under PO’s construction of “*synchronization information.*”

e) Limitation [16D] and [16E]

124. The combination of Gilb and 802.15.3 discloses “*the time slot being determined according to a priority level data associated with a class*” [16D], and “*the class associated with the one or more of the portable client device and the user of the portable client device*” [16E], under PO’s interpretation of “*class associated with [device/user].*”

125. In IEEE 802.15.3, the PNC “allocat[es] channel time” according to an allocation algorithm which is also often referred to as a “scheduling” algorithm or simply “scheduler.” (INTEL-1005, 66, 26 (“PNC ... operates as the arbitrator in assigning channel time”); *see also id.*, 44, 167, 258 (each referring to channel “allocation algorithm”; INTEL-1006, 173 (referring to “algorithm used to allocate the channel time and assign[] CTAs”).) The PNC assigns the CTAs in a superframe in response to “channel time requests (CTRqs)” received from DEVs in the piconet. (*See, e.g.*, INTEL-1005, 35-36; INTEL-1006, 172.)

126. The CTA allocations at the PNC can be considered as a queue of CTA assignments, CTA_1 - CTA_n , where n is the maximum number of CTAs in the CTAP as reflected in 802.15.3 Figure 2 below. (INTEL-1006, 11-12, Figure 2; INTEL-1018, 2480 (referring to allocated CTAs as “queue”).) I developed the figure on the right below, based on Figure 2 from IEEE 802.15.3, on the left, along with some exemplary data, to illustrate conceptually the CTA assignment data tracked by the PNC for CTA allocations each superframe. (INTEL-1006, 117 (content of CTA block).) Although not reflected in this table, the PNC also knows the type of CTA allocation, e.g., pseudo-static or dynamic. As I have discussed above, a pseudo-static CTA maintains the same CTA location from superframe to superframe. (INTEL-1005, 59.) Therefore, if CTA-2 is a pseudo-static CTA, it will have the same location and duration in each superframe (e.g., the same place in the CTA “queue”).

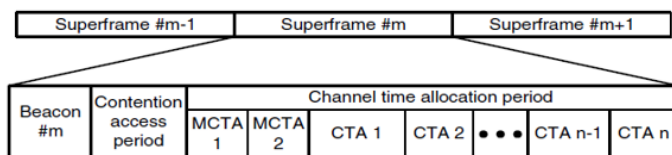


Figure 2—802.15.3 piconet superframe

	location	duration	source	destination
CTA 1	0	10000	DEV 1	DEV 2
CTA 2	10001	20000	DEV 4	DEV 6
.				
.				
.				
CTA n-1	400001	50000	DEV 2	DEV 3
CTA n			unassigned	unassigned

802.15.3 Figure 2 (left), Figure A, Exemplary Data (right)

127. The combination of Gilb and 802.15.3 discloses or at least suggests two allocation/scheduling techniques performed by the PNC (e.g., how the PNC

determines the CTA “queue”). Each of these techniques independently meets limitations [16D]-[16E] under PO’s interpretation of “*class associated with [device/user]*.” First, IEEE 802.15.3 assigns a CTA based on the DEV’s power management status (hereinafter “Power Management Status Allocation”). Second, IEEE 802.15.3 suggests allocation of CTAs based on QoS category (hereinafter “QoS Allocation”).

i. Power Management Status Allocation

(a) IEEE 802.15.3 Power Management Overview

128. Gilb explains that a “key advantage” of IEEE 802.15.3 “is its support of power management modes.” (INTEL-1005, 40.) I provided a discussion of the IEEE 802.15.3 PM modes in §III.A.2.a.v. As I discussed in this section, a DEV, when changing its PM status, informs the PNC of its PM mode through the PM Mode Change command, which informs the PNC of whether the DEV is currently operating in ACTIVE, APS, or SPS mode, illustrated in Figure 88 below. (INTEL-1005, 110-11.) Gilb does not include the format of the PM mode change command and therefore the POSITA would have turned to 802.15.3 for the reasons I discussed in §IV.A.3 which provides this disclosure. (INTEL-1006, 148, Figure 88 (below).) For example, the PM mode field of the command indicates whether the device is in ACTIVE mode, APS mode, or SPS mode (e.g., DSPS or PSPS mode). (*Id.*, 148.) Through receipt of these commands, PNC has knowledge of the current

PM mode of each DEV when performing the allocation algorithm to allocate CTAs for current and future superframes.

octets: 1	2	2
PM mode	Length (=1)	Command type

Figure 88—PM mode change command format

(b) Allocations Based on Power Management (PM) Status

129. One or both of the source and destination DEVs identified in a request for a CTA may be operating in SPS mode. Because a device operating in an SPS mode device is in an AWAKE state only for the superframe when its designated wake beacon occurs, the PNC must take into consideration the PM mode of both the source and destination when allocating CTAs. (INTEL-1006, 145.)

130. 802.15.3 specifies that the “PNC should attempt **to allocate the CTAs of all SPS** [synchronized power save] DEVs **first in the superframe.**” (*Id.*, 172) (also describing exceptions “to placing these allocations first”).) From this statement, a POSITA would have understood that in IEEE 802.15.3, the location of CTAs for SPS mode DEVs is the earliest available allocation in the CTAP portion of the superframe (e.g., SPS DEVs are assigned to CTAs at the front/top of the CTA “queue”). A POSITA would have further understood this allocation location to be the “*time slot[s]*” transmitted first in the CTAP portion of the superframe.

131. Gilb explains that it is the “goal in any power management strategy” for “the DEV to turn off as many of its operations as possible for the longest period of time.” (INTEL-1005, 40.) As Gilb describes the “target market for 802.15.3 includes a large number of portable products where power usage is a critical performance measure.” (*Id.*, 100.) Therefore, “[a]lthough it is important to do as much as possible to reduce the active power required by the MAC and PHY, really large power savings can only come from turning off the DEV.” (*Id.*) In most wireless DEVs, “the majority of time that the DEV is operating is spent in receive mode, waiting for something to happen in the piconet.” (*Id.*) Accordingly, “the transmit power requirements are secondary in importance to the receiver power requirements, especially for relatively short range PHYs like ... the 2.4 GHz PHY of 802.15.3.” (*Id.*) That is, the “receiver power [] dominates the battery life” and therefore “an efficient power savings method needs to make sure that the receiver is only turned on when it is absolutely necessary.” (*Id.*, 101.)

132. Accordingly, based on 802.15.3’s disclosure of assigning SPS CTAs “first in the superframe,” and Gilb’s disclosure about assigning CTAs “first in the superframe”, a POSITA would have understood that SPS mode CTAs are assigned to the earliest available slots in the CTAP period so devices in SPS mode can maximize the amount of time the DEV is in continuous SLEEP state during a superframe. SPS DEVs therefore have “*priority*” (i.e., have “a right to take

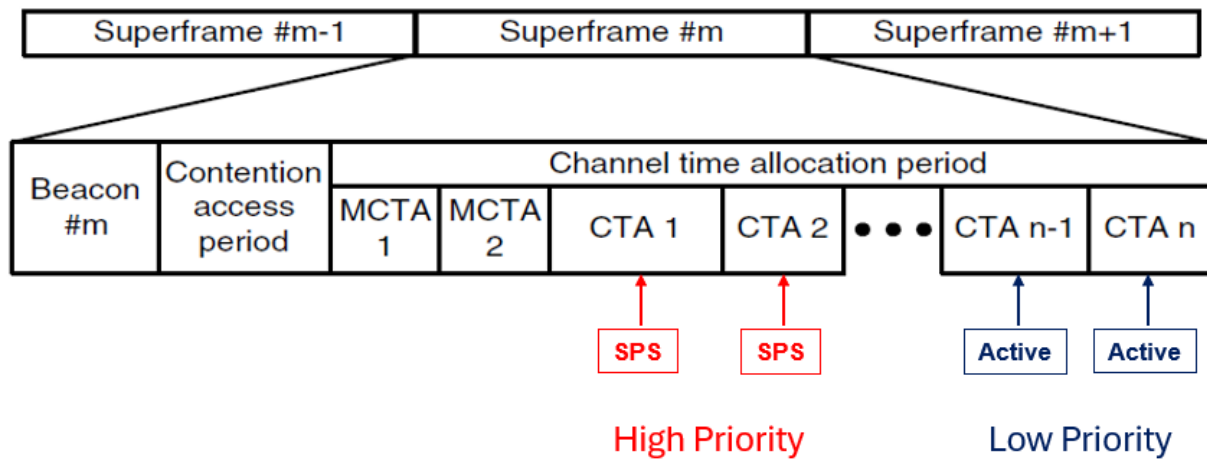
precedence or proceed before” (*Supra* §III.E.2; INTEL-1002, 441)) over non-SPS devices based on their “*class*” (PM Mode) under PO’s interpretation.

133. A POSITA would have understood that for the PNC to assign CTAs to SPS DEVs “first in the superframe,” the PNC must access data identifying the PM status of the DEVs. For example, the PNC access data indicating the DEVs operating in SPS mode and those that are not and applies logic in its allocation algorithm (often referred to as a “rule”) that prioritizes the identified SPS mode DEVs over non-SPS mode DEVs. Thus, the combination of Gilb and 802.15.3 discloses the recited “*priority level data*.” Indeed, as I discussed above, the combination of Gilb and 802.15.3 describes a message informing the PNC of any change in the PM status of a DEV and also provides an indication of the SPS set membership of a DEV in the CTA allocation request. (*See, e.g.*, INTEL-1005, 119; INTEL-1006, 139.)

134. Thus, in a PM status allocation algorithm, power management (PM) mode (SPS or ACTIVE) of the CTA source and/or destination DEVs if the recited “*class*” under PO’s interpretation of the term in the co-pending district court litigation. (*See* §III.E.2.) The teachings and suggestions of both Gilb and 802.15.3 are consistent with the limited disclosures of the ‘129 patent, which merely observe “*priority level data*” may be used to facilitate differentiation of class tiers, without prescribing any data form. (INTEL-1001, 16:17-20.)

135. The PM mode reflects the power management mode of the DEV and is therefore “*associated with the client device,*” under PO’s interpretation. One or both of the source and destination DEVs identified in a request for a CTA may be operating in SPS mode. Because an SPS mode device is in an AWAKE state only for the superframe when its designated wake beacon occurs (INTEL-1005, 41), a POSITA would have understood the PNC’s allocation/scheduling algorithm takes into consideration the PM mode of both the source and destination when allocating CTAs as I discussed above to ensure both are awake to hear the allocation. (*Id.* (“Because an 802.15.3 communications link is peer-to-peer, it is important that both the source and destination are awake at the same time so that they can exchange frames”); INTEL-1006, 145.)

136. The following annotations of Figure 2 from 802.15.3 illustrate an exemplary allocation of CTAs between SPS and ACTIVE modes in a superframe, with SPS mode receiving CTA assignments earlier in the superframe than ACTIVE mode. (INTEL-1006, 12 (Figure 2).) Thus, through the power management status allocation algorithm, the combination of Gilb and 802.15.3 discloses “*the time slot being determined according to a priority level data associated with a class*” [16D], “*the class associated with the one or more of the portable client device and the user of the portable client device*” [16E] under PO’s interpretation of “*class associated with [device/user].*”



802.15.3, Annotated Figure 2

137. To the extent allocation/scheduling based on PM status is determined not to be explicitly disclosed in the combination of Gilb and 802.15.3, a POSITA would have had a reasonable expectation of success in modifying the PNC of the combination of Gilb and 802.15.3 to include an allocation/scheduling algorithm. The allocation/scheduling algorithm involves computer programming which would have been well within the skill of a POSITA. Moreover, time slot scheduling algorithms were known prior to the '129 patent (*See, e.g.*, U.S. Patent 5,748,624 (based on bandwidth).) Gilb references the existence of CTA algorithms and notes that the IEEE 802.15.3 standard did not specify an algorithm because “[m]ost companies consider their CTA algorithm to be a proprietary advantage in developing solutions.” (INTEL-1005, 258; *see also id.*, 93.) For example, the paper “Novel scheduling scheme and MAC enhancements for IEEE 802.15.3 high-rate WPAN” to Zeng (published in 2005 in the “2005 IEEE Wireless Communications

and Networking Conference” and uploaded to IEEE Xplore on May 2, 2005) describes a CTA scheduling algorithm and also references scheduling algorithms used in Bluetooth systems and other ad hoc networks. (*See* INTEL-1018.) Thus, the combination of Gilb and 802.15.3 renders limitations [16D]-[16E] obvious.

ii. QoS Allocation

138. As I mentioned above, other than specifying that devices operating in SPS mode have higher priority CTA allocation, IEEE 802.15.3 leaves the details of a CTA allocation algorithm open as a device implementation detail. (*See, e.g.,* INTEL-1005, 93, 258 (CTA allocation algorithm left as implementation function); INTEL-1006, 173 (“algorithm used to allocate the channel time and assign CTAs is outside of the scope of this standard.”).) Gilb suggests use of an allocation/scheduling algorithm that allocates CTAs based on QoS category of the data to be transmitted between a source and destination, as indicated in the CTA request message.

139. QoS refers to the performance and reliability of the network and is often associated with measurable parameters that determine the level of service provided by a network such as bandwidth, latency, and packet/frame loss. A high QoS ensures smooth and uninterrupted communications whereas a poor QoS can lead to service disruption. QoS is often used to determine the priority of data traffic transmission on a network, by optimizing parameters such as latency, jitter, and

packet error rate (PER) as long as the connection can supply the required bandwidth to support the application.

140. Gilb explains that “[i]sochronous applications need a guaranteed data rate and latency to support the quality of the user experience” but a “wireless connection, on the other hand, deals only with channel time, frame error rates (FERs), and instantaneous bit rates.” (INTEL-1005, 92.) Therefore, in IEEE 802.15.3, “[o]ne of the key issues in creating connections that support QoS is to map the requested bandwidth and latency into channel time and its repetition, i.e., the latency between allocations.” (*Id.*) Gilb explains that a “PNC with a good **CTA algorithm** will be able to better maintain **the QoS** in [the] piconet and to provide greater overall throughput.” (*Id.*, 258.) A POSITA would have understood based on these suggestions in Gilb the need to incorporate QoS in the CTA allocation algorithm and would have been motivated to do so to ensure QoS of the data transmitted in the piconet, specifically for isochronous applications involving voice and/or video. A TDMA protocol is ideal to assure QoS because transmissions can be tightly scheduled to meet latency requirements.

141. IEEE 802.15.3 uses a hierarchical QoS “priority scheme” defined by IEEE 802.1D and reproduced in Gilb Table 8-5 below for scheduling data transmission between peer devices. (*See* INTEL-1006, 277-280 (describing the frame convergence sublayer (FCSL) which provides functions for data transfer and

uses 802.1D QoS scheme to classify data for transmission); INTEL-1005, 270.)

IEEE 802.1D is widely used throughout the IEEE 802 family of wired and wireless protocols; it was originally developed to prioritize transmissions over wired technologies such as Ethernet (IEEE 802.3) but has since been generalized to wireless protocols such as those in IEEE 802.15. Gilb's Table 8-5 is simply a reproduction of Table A.1 from 802.15.3 (INTEL-1006, 280.) This priority scheme "defines eight possible priority levels" referred to as "user priority" levels, associated "with seven defined traffic types" (the "QoS category"). (*Id.*) For example, voice telephony applications are given the highest priority (priority 6). (*See* INTEL-1005, 16-17 (describing high priority audio applications).) Streaming multimedia applications are given a lower priority (e.g., priority 3 or 5) because they have "high requirements for throughput, but they often have more relaxed latency requirements." (*See id.*, 19-20.) I note that priority 7 is designated for network control traffic which is not applicable to data transmissions between peer DEVs in an IEEE 802.15.3 piconet. (*See* INTEL-1006, 280.) And the priority level of 2 is currently not assigned to a traffic class. (*See* INTEL-1005, Table 8-5, 270.)

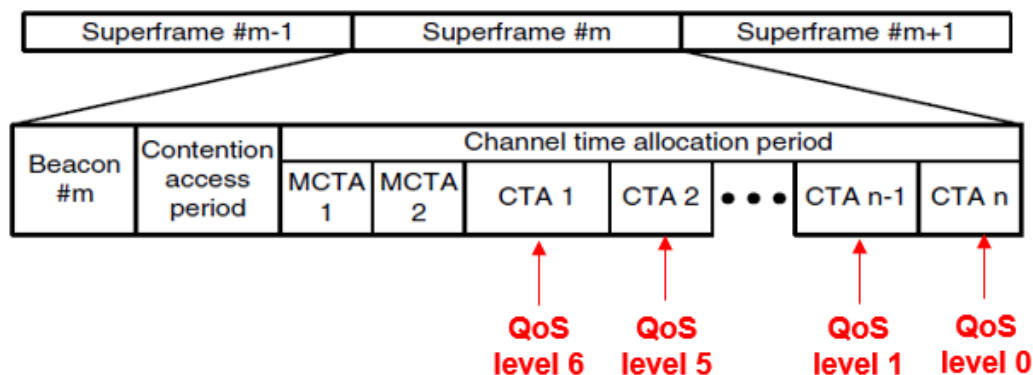
Table 8–5: IEEE Std 802.1D traffic types

User priority	Traffic type	Used for	Comments
0 (default)	Best effort (BE)	Asynchronous	Default level
1	Background (BK)	Asynchronous	–
2	–	Spare	Currently not assigned
3	Excellent effort (EE)	Isochronous	For valued customers
4	Controlled load (CL)	Isochronous	Traffic will have to conform to some higher protocol layer admission control
5	Video (VI)	Isochronous	< 100 ms delay and jitter
6	Voice (VO)	Isochronous	< 10 ms delay and jitter
7	Network control (NC)	–	–

142. During operation of an IEEE 802.15.3 piconet, a source DEV shares the QoS categorization of the data it intends to transmit to a destination in its CTA request. (See INTEL-1006, 139-40 (specifying that the “Priority field” in the CTRq control field is defined by “Table A.1”).) Thus, the PNC has knowledge of the QoS categorization of every CTA request when making its allocation decision.

143. Accordingly, based on the above suggestions by Gilb, a POSITA would have been motivated to integrate a CTA allocation/scheduling algorithm based on the QoS of the data to be transmitted between a source/destination pair. Specifically, similar to how a DEV uses QoS to determine transmission priority discussed above, a POSITA would have been motivated to sort CTAs to be allocated for the next superframe in the PNC queue in increasing order of QoS

priority with highest QoS (6: voice) at the top/front, and continuing allocations down the CTA queue in order of descending QoS level (6 to 0), to ensure data requiring a higher QoS receives a “*time slot*” allocation in the superframe. A POSITA would have also recognized the potential need to order CTAs in the same QoS level (e.g., if two or more allocation requests shared a QoS level) and would have understood techniques such as sub-ordering by duration or request time would be applicable. I also note that QoS prioritization could be used with PM allocation discussed above. For example, DEVs in the SPS class can be prioritized based on QoS and DEVs with in the non-SPS class can also be prioritized based on QoS or vice versa. The queue of allocated CTAs determined by the PNC is mapped to the available positions in the CTAP, as illustrated in the exemplary figure below illustrating allocation based on QoS alone.



802.15.3, Annotated Figure 2

144. A POSITA would have had a reasonable expectation of success in modifying the combination of Gilb and 802.15.3 to include a QoS CTA

allocation/scheduling algorithm such as described above and the results of this combination because a DEV provides the QoS category in its CTA request. (See INTEL-1006, 139-140 (specifying that the “Priority field” in the CTRq control field is defined by “Table A.1”).) Further, allocation/scheduling based on QoS level was known, as noted above for the data transmission context. For example, the Zeng paper discussed above builds on the basic notion of arranging CTAs in increasing order of their QoS categories with a scheduling algorithm addressing CTA saturation where all CTAs are allocated, e.g., by reducing the duration of low priority CTAs. (See, e.g., INTEL-1018, 2480.) Other methods for scheduling could include interference mitigation or collision avoidance in order to improve QoS.

145. In the QoS allocation technique, the “*class*” is the QoS category (e.g., “voice (VO)”, “video (VI)”, “best effort” asynchronous) and is associated with both the source and destination DEVs which are the endpoints for the data to be transmitted, under PO’s interpretation of the “*class associated with [device/user]*” term. (See §III.E.2; see also, e.g., INTEL-1006, 279 (indicating that data is classified according to destination, source, and 802.1D priority QoS scheme).) I understand that PO has identified a QoS category as a “*class*,” noting that “the access point . . . first sends out a buffer status report poll (BSRP) to all devices requesting they report back, among other things, the **quality of service (QoS)**

category, i.e. a first class, of the data they need to send.” (INTEL-1015, Exhibit A, 5.) I understand that PO also alleged the “class of QoS data a device needs to receive will be associated with the device and the user. Data to be received by a device will be associated with the device, specifically applications the device is running” and “data is also associated with the user in that the user is interacting with the application to request the data.” (INTEL-1018, 8.)

146. Thus, under PO’s interpretation, the “*class*” in the combination of Gilb and 802.15.3 is associated with the device that is originating the data (e.g., voice, video, asynchronous) and with the user by virtue of the user interacting with the application. (See §III.E.2.) And under PO’s interpretation, in the QoS allocation suggested by the combination of Gilb and 802.15.3, “*the class [is] associated with the one or more of the portable client device and the user of the portable client device*” [16E].

147. The QoS category (a “*class*” under PO’s interpretation) is associated with a QoS priority level (the “*priority level data*”)—e.g., QoS level 6 is highest priority and QoS level 0 (“best effort”) is associated with the lowest priority. For example, for priority 6 voice traffic, the PNC may assign one CTA in each superframe for data transmission to maintain the needed QoS; for priority 3 isochronous traffic, the PNC may assign a CTA every *n* superframes; and for priority 1 asynchronous traffic, the PNC may assign a CTA in a superframe when a

CTA is available. As described above, the PNC arranges the CTA queue according to priority, meaning that CTAs at the start of the superframe are assigned to higher priority (i.e., higher QoS level) CTAs. Thus, under PO's interpretation, "*the time slot*" assigned to a source/destination "[is] *determined according to a priority level associated with a class*," a QoS category [16D], under PO's interpretation of "*class associated with [device/user]*."

2. Independent Claim 18

148. Claim 18 recites:

[18P] A method of facilitating data exchange, comprising:

[18A] wirelessly broadcasting synchronization information to a portable client device;

[18B] the synchronization information comprising information assigning a time slot during which the client device can receive data,

[18C] the time slot being determined according to priority level data associated with a class,

[18D] the class associated with one or more of the portable client device and the user of the portable client device; and

[18E] wirelessly broadcasting data for reception by the client device during the time slot.

149. Claim 18 recites substantially similar limitations as claim 16 with the primary differences being: (1) claim 18 recites "*a method of facilitating data exchange*" whereas claim 16 recites "*a system*" and (2) claim 16 requires the client device be configured to wirelessly receive synchronization information, whereas

claim 18 merely requires wirelessly broadcasting synchronization information to a client device. I provide the following table to highlight the differences between the claims. Thus, for the reasons I discussed in §IV.B.1.b), d), and e), the combination of Gilb and 802.15.3 discloses limitations [18A]-[18D]. I address the preamble [18P] and limitation [18E] are below.

150. The chart below shows the correlations between the limitations of claim 16 and claim 18, with labels.

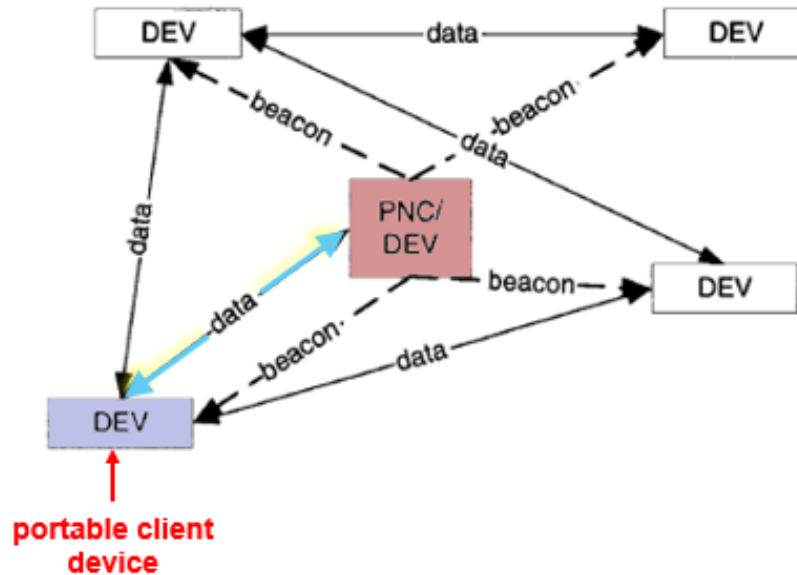
Claim 16	Claim 18
[16P] A system, comprising:	[18P] A method of facilitating data exchange, comprising:
[16A] a network device configured to wirelessly broadcast synchronization information; and	[18A] wirelessly broadcasting synchronization information to a portable client device,
[16B] a portable client device configured to wirelessly receive the synchronization information,	
[16C] the received synchronization information comprising information assigning a specific time slot during which the client device can receive data from the network device,	[18B] the synchronization information comprising information assigning a time slot during which the client device can receive data,
[16D] the time slot being determined according to a priority level data associated with a class,	[18C] the time slot being determined according to priority level data associated with a class,
[16E] the class associated with the one or more of the portable client device and the user of the portable client device.	[18D] the class associated with one or more of the portable client device and the user of the portable client device; and

	[18E] wirelessly broadcasting data for reception by the client device during the time slot.
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a) Preamble [18P]

151. The combination of Gilb and IEEE 802.15.3 discloses “*a method of facilitating data exchange,*” to the extent that the preamble is determined to be limiting [18P].

152. The IEEE 802.15.3 “piconet is a wireless ad hoc data communications system which allows a number of independent data devices (DEVs) to communicate with each other.” (INTEL-1006, 8, Figure 1 (below); *see also* INTEL-1005, 25.) As I discussed in §IV.B.1.d, the CTA block in the CTA IE portion of the beacon specifies a source DEV “to which the channel time is being allocated” and a destination DEV “to which the source DEV may send the frame.” (INTEL-1006, 117.) That is, the CTA is designated for the source and destination to exchange data. Thus, the combination Gilb and 802.15.3 discloses a “*method of facilitating data exchange*” between two devices in the piconet. (*Id.*, 8-9 (802.15.3 facilitates “efficient data transfer”); *see also supra* §IV.B.1.d) (describing a “*time slot during which the client device can receive data from the network device*”).)

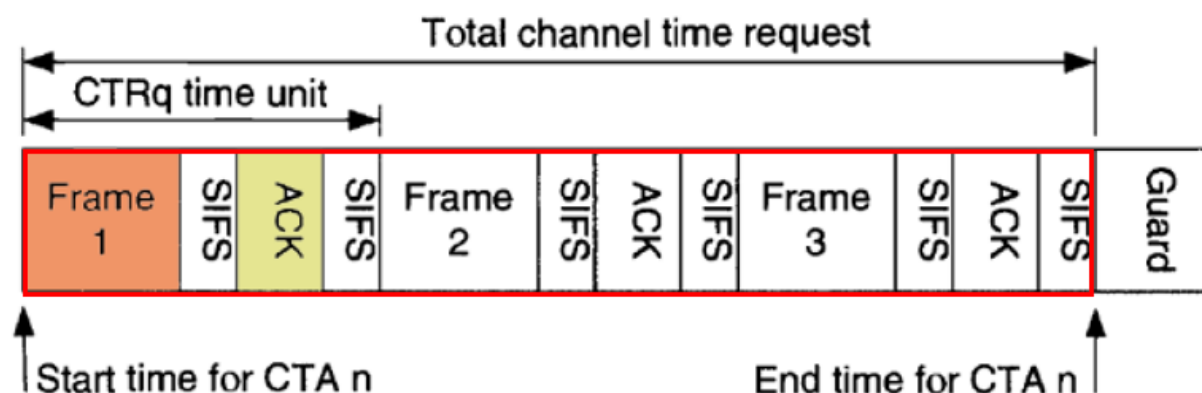


Gilb, Annotated Figure 3-1

153. Should the Board determine that “*data exchange*” requires bi-directional communication between two devices, Gilb’s Figure 3-1 above demonstrates that data is exchanged between the DEVs and between a PNC/DEV and a DEV, as demonstrated with double arrows between the two devices. (INTEL-1005, 29.)

154. 802.15.3 further discloses an “[i]mmediate acknowledgment (Imm-ACK)” sent by a DEV within an assigned CTA “to confirm” receipt of a frame. (*Id.*, 81-82, *see also id.*, 94.) Figure 4-17 (below) illustrates a frame-ACK “*data exchange*” between two devices within an assigned CTA (indicated by a red box). The label “Total channel time request” reflects that the assigned CTA (red box) is equal to the channel time requested by the transmitting device. The CTA includes

three smaller “time units” (CTRq time unit) consisting of a Frame, short interframe space (SIFS), ACK, and SIFS. The “SIFS is the length of time required for the PHY to switch between transmit and receive” and “is used when the DEV that is transmitting expects a response from another DEV, e.g., an ACK.” (*Id.*, 54.) In this example, the source DEV can transmit three frames within its assigned CTA (“time slot”). As shown, a frame (shaded orange) is transmitted/received at the start of the assigned CTA followed by an Imm-ACK (shaded yellow) after an SIFS. (*See id.*, 94-95.) Both the frame and ACK are therefore exchanged during the allocated CTA.



Gilb, Annotated Figure 4-17

b) Claim Limitation [18A]

155. Limitation [18A] recites “*wirelessly broadcasting synchronization information to a portable client device.*” Claim 16 recites “*a network device configured to wireless broadcast synchronization information*” [16A] and “*a portable client device configured to wirelessly receive the synchronization*

information” [16B]. As I discussed in §§IV.B.1.b-c, the beacon is broadcast to all DEVs in the piconet and therefore it is broadcast to and received by the “*portable client device*.” Thus, under the PO’s interpretation of “*synchronization information*,” for the reasons discussed in §§IV.B.1.b-c, the combination of Gilb and 802.15.3 also discloses limitation [18A].

c) Claim Limitation [18B]

156. Limitation [18B] recites “*the synchronization information comprising information assigning a time slot during which the client device can receive data.*” Limitation [16C] recites “*the received synchronization information comprising information assigning a specific time slot during which the client device can receive data from the network device.*” Thus, under the PO’s interpretation of “*synchronization information*,” for the reasons discussed in §IV.B.1.d, the combination of Gilb and 802.15.3 also discloses limitation [18B].

d) Claim Limitation [18C]

157. Limitation [18C] is identical to limitation [16D]— “*the time slot being determined according to priority level data associated with a class.*” Thus, for the reasons discussed in §IV.B.1.e, the combination of Gilb and 802.15.3 also discloses limitation [18C] under the PO’s interpretation of the “*class associated with [device/user]*” term.

e) Claim Limitation [18D]

158. Limitation [18D] is substantially identical to limitation [16E] with the sole difference being that limitation [16E] recites “with **the** one or more of the portable client device” whereas [18D] recites “with one or more of the portable client device.” Thus, for the reasons discussed in §IV.B.1.e, the combination of Gilb and 802.15.3 also discloses limitation [18D].

f) Claim Limitation [18E]

159. The combination of 802.15.3 and Gilb discloses “*wirelessly broadcasting data for reception by the client device during the time slot*” [18E].

160. A CTA (“*time slot*”) is “[a] contiguous period of time in the superframe allocated by the piconet coordinator **for communication between specified source and destination.**” (INTEL-1006, 3.) As discussed in §IV.B.1.b-d, the PNC assigns a CTA (“*time slot*”) to a source-destination and communicates the assignment “to the DEVs in the piconet via the CTA IE in the beacon.” (INTEL-1005, 35, 56-57.) As discussed in §IV.B.1.d, the assigned “*time slot*” is for the “*client device [to] receive data.*” Thus, the combination of Gilb and 802.15.3 discloses that “*data*” is transmitted “*for reception by the client device during the time slot.*” (See *id.*, 48 (“A DEV that is sending a frame is the source of the frame, whereas the DEV (or DEVs) that are the intended recipient of the frame is the destination”).)

161. The combination of Gilb-802.15.3 discloses “*wireless broadcasting*” as used in the ’129 patent claims in multiple ways. First, Gilb describes that a piconet supports use of a broadcast ID (BcstID) as the destination ID of a CTA. (See *id.*, 102-103, 80-81.) When allocating a CTA to a BcstID as a destination, the PNC considers the class of all DEVs in the piconet. For example, if one of the DEVs (e.g., the “*client device*”) is in SPS mode, the PNC will attempt to allocate the broadcast CTA to a wake superframe for the SPS device. (See, e.g., *id.*, 42-43, 103; INTEL-1006, 62-63.) When the data is broadcast to the BcstID during the allocated CTA, all DEVs in an AWAKE state receive the transmitted data. (See INTEL-1005, 103-104, Table 4-4.)

162. Moreover, to the extent “*wireless broadcasting*” in claim 18 encompasses a directed wireless transmission to the “*client device*,” as discussed above in §IV.B.1.d, the combination of Gilb and 802.15.3 describes such directed wireless transmission. (See INTEL-1005, 25, 31, 32, 56-57; *see also*, INTEL-1006, 1, 8, 151, 171.)

163. Finally, IEEE 802.15.3 defines an operating mode 0 in which “no security is provided and the piconet is wide open.” (INTEL-1005, 190; INTEL-1006, 221.) In any wireless system, a device makes a wireless transmission and any device that is AWAKE can receive the transmission. If the data is encrypted, a device receiving the transmission cannot “read” the data without the appropriate

key. That is, in an unsecured wireless network, data is “broadcast.” The receiving DEV may ignore the received data if it is not the intended recipient. Thus, if no security is provided, data transmitted to the “*client device*” is unprotected (i.e., unencrypted) and any listening device receives the data. (INTEL-1005, 190-91.) In this circumstance as well, the combination of Gilb and 802.15.3 discloses “*wirelessly broadcasting data for reception by the client device during the time slot.*”

3. Independent Claim 1

164. Claim 1 recites:

[1P] A method of facilitating data exchange, comprising:

[1A.1] assigning a first specific time slot for a first client device to wirelessly communicate with a fixed proximity-based reader device,

[1A.2] the first specific time slot set according to a first class; and

[1B.1] assigning a second specific time slot for a second client device to wirelessly communicate with the fixed proximity-based reader device,

[1B.2] the second specific time slot set according to a second class,

[1C] wherein the first and second specific time slots are determined based on synchronization information wirelessly received by the first and second client devices and priority level data associated with the first class and with the second class, and

[1D] wherein the first class is associated with one or more of the first client device and a user of the first client device, and the second class is associated with one or more of the second client device and a user of the second client device.

165. Claim 1 is substantially similar to claim 18 and is also similar to claim 16. Therefore, my analysis of the limitations of claims 16 and 18 applies to similar limitations in claim 1 as explained below.

a) Preamble [1P]

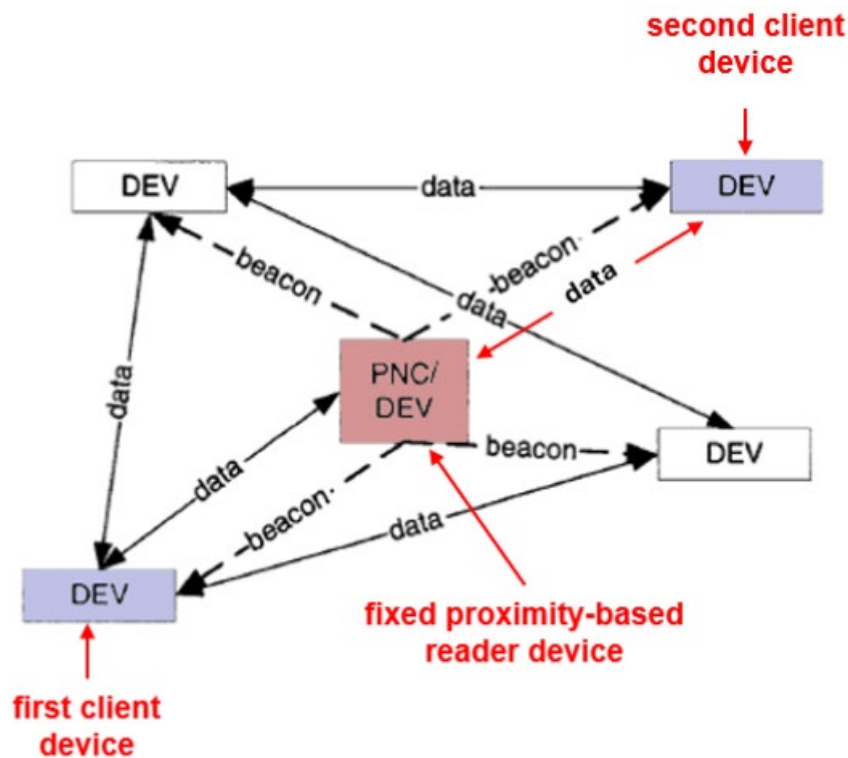
166. The preamble [1P] is the same as claim 18's preamble [18P]—*“method of facilitating data exchange.”* For the reasons discussed in §VI.B.2.a, the combination of Gilb and 802.15.3 combination discloses [1P].

b) Limitations [1A.1]/[1B.1]

167. The combination of Gilb and 802.15.3 discloses *“assigning a first specific time slot for a first client device to wirelessly communicate with a fixed proximity-based reader device”* [1A.1] and *“assigning a second specific time slot for a second client device to wirelessly communicate with the fixed proximity-based reader device”* [1B.1].

iii. “a first/second client device” / “a fixed proximity-based reader device”

168. As discussed in §VI.B.1.c, an 802.15.3 piconet includes a PNC/DEV and one or more DEVs, which are each a *“client device.”* (See INTEL-1005, 25 Figure 3-1 (below); INTEL-1006, 8; § VI.B.1.c (16B, discussing a *“portable client device”*).) Thus, Gilb-802.15.3 discloses a *“first client device”* and *“second client device.”*



Gilb, Annotated Figure 3-1

169. IEEE 802.15.3 supports devices that are “*fixed*.” (See INTEL-1006, 1 (“This standard defines the PHY and MAC specifications for high data rate wireless connectivity with **fixed**, portable and moving devices ...”).)

170. Gilb discloses exemplary IEEE 802.15.3 applications using one or more devices which a POSITA would have understood to be “*fixed*.” In one example, Gilb describes a photo kiosk that enables digital cameras to wirelessly transfer pictures. (INTEL-1005, 14.) In that example, a POSITA would understand the kiosk acts as the PNC/DEV and the cameras as DEVs. (See *id.*, 25, 67 (describing factors in determining which DEV acts as PNC); INTEL-1006, 4, 152-155.) In a different example, Gilb describes a game console/router which acts as

the access point for the controllers to a game, as a wireless router for the house, and streams audio to devices (e.g., speakers and headphones). (INTEL-1005, 18-19.) In that example, as I discussed above, a POSITA would understand the game console/router acts as a PNC/DEV and the controllers, speakers, headphones, etc. act as client DEVs. (*Id.*, 67.)

171. Gilb explains that “the extent of the piconet is determined by the ability of DEVs to hear the beacon transmitted by the PNC.” (*Id.*, 25.) 802.15.3 similarly provides that “[a] piconet is distinguished from other types of data networks in that communications are normally confined to a small area around person or object that typically covers at least 10 m in all directions and envelops the person or a thing whether stationary or in motion.” (INTEL-1006, 8.) That is, the PNC/DEV is a “*proximity-based*” device because its ability to communicate with other devices depends on geographic proximity of the PNC/DEV to the receiving device, for example, a device within an area of about 10m can communicate with other DEVs in the piconet, a device outside that area cannot. (INTEL-1005, 80 (“Because it is possible or even likely that DEVs will move out of range of the PNC without the PNC being aware of it . . .”), 131(“the DEV can move out of range of the PNC in its normal operation.”), 155 (accessing photo kiosk “in the vicinity”).)

172. The PNC/DEV controls access to the piconet by accepting or rejecting association requests received (read) from DEVs within its proximity, so it is a “reader device” consistent with the disclosure of the ’129 patent. (*See, e.g.*, INTEL-1001, 5:24-28 (“When an individual carrying the PDK14 comes into proximity of the RDC 12 by entering a coverage area of the RDC 12, a wireless communications session is initiated between the PDK14 and the RDC 12.”), 7:2-3 (“an RDC is a device that acts as a gatekeeper controlling access of a PDK to a particular system”); INTEL-1005, 66 (PNC “responsible for starting and stopping the piconet, admitting DEVs into the piconet, allocating channel time, changing the piconet channel if conditions deteriorate, and keeping the piconet parameters current”), 74-76; INTEL-1006, 11 (“Security for the piconet is one of two modes Mode 0—Open: The PNC is allowed to use a list of DEV addresses to admit or deny entry to the piconet Mode 1 DEVs establish secure membership with the PNC before they have access to the piconet’s resources.”).) For example, Gilb teaches that the PNC/DEV “controls membership in the piconet using association, disassociation, and secure membership.” (INTEL-1005, 302.) If security is enabled in the piconet, the PNC/DEV performs an “authentication method” as part of the “secure membership process” for DEVs requesting association with the piconet. (*See id.*, 75-76.) And as explained in §IV.B.1.d, IV.B.2.f, DEVs “wirelessly communicate with” the PNC/DEV.

173. Thus, the PNC/DEV of the combination of Gilb and 802.15.3 discloses a “*fixed proximity-based reader device*” under the plain and ordinary meaning of the term. And because the PNC/DEV is fixed, wirelessly interacts with client devices, controls access to the piconet, and links a user to applications, assets and services, the combination of Gilb and 802.15.3 also discloses a “*fixed proximity-based reader device*” under PO’s construction—“a fixed access point that can wirelessly interact with a client device to link the user with various applications, assets, and/or services.” (INTEL-1012, 1.)

iv. “assigning a first/second specific time slot for a first/second client device to wirelessly communicate with” the PNC/DEV

174. The combination of Gilb and 802.15.3 discloses “*assigning a first specific time slot for a first client device to wirelessly communicate with a fixed proximity-based reader device*” [1A.1] and “*assigning a second specific time slot for a second client device to wirelessly communicate with the fixed proximity-based reader device*” [1B.1].

175. The PNC “operates as the arbitrator in assigning channel time.” (INTEL-1005, 26; *supra* §III.A.2.a.iv.) The PNC performs a “CTA algorithm” to determine how to allocate the available CTAs based on the CTA requests (CTRqs) received. (*See, e.g.*, INTEL-1005, 258; *supra* §III.A.2.a.iv (Background).) As Gilb explains, the details of the CTA allocation algorithm are not defined in the standard (aside from the power management status allocations discussed in §§III.A.2.a.v,

IV.B.1.e.i) and are instead left as an implementation detail for the device manufacturer. (See INTEL-1005, 258; INTEL-1006 173 (“The algorithm used to allocate the channel time and assign CTAs is outside the scope of this standard.”).)

176. As discussed in §IV.B.1.d for the “*assigning a specific time slot*” limitation of claim 16 ([16C]), each individual CTA assignment made by the PNC/DEV specifies the CTA duration and location which collectively identify a “*specific time slot*” for communication between the identified source and destination DEVs. (See INTEL-1005, 56-57; INTEL-1006, 117, Figures 25 and 26.) Because the superframe contains multiple CTAs that are separately assigned by the PNC/DEV to a source/destination DEV pair, the combination of Gilb and 802.15.3 discloses “*assigning a first specific time slot*” (e.g., CTA 1) and “*assigning a second specific time slot*” (e.g., CTA n). (See, e.g., INTEL-1006, Figure 2 (below), 12.) For the reasons explained for 16[C] and 18[E], CTAs (“*time slots*”) are assigned “*for a [first]/[second] client device to wirelessly communicate with*” (e.g., by receiving data from) the PNC/DEV. (See *supra* §IV.B.1.d for “*client device ... receiv[ing] data from the network device*” and §IV.B.2.f for “*wirelessly broadcasting data*”; see also, e.g., INTEL-1005, 19; INTEL-1006, 1, 8, 12.)

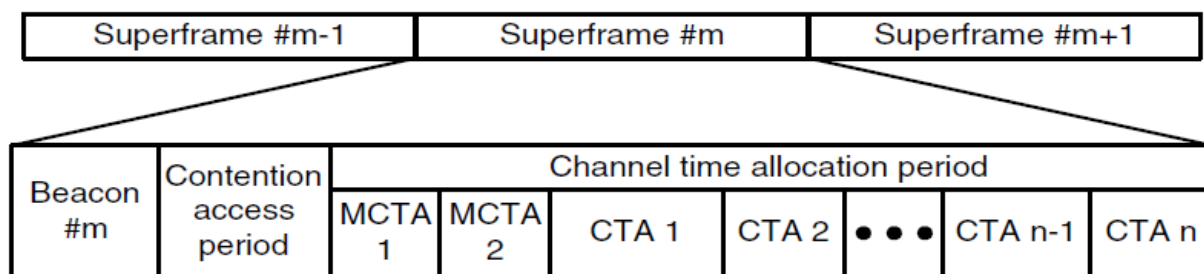


Figure 2—802.15.3 piconet superframe

177. In IEEE 802.15.3, a DEV also communicates with the PNC/DEV acting in its DEV capacity by transmitting data to the PNC/DEV. (INTEL-1005, 25, 47-48, 57, 168, 300; INTEL-1005, 19.) That is, as demonstrated by annotated Gilb Figure 3-1 above, the “*first client device* [DEV]”/ “*second client device* [DEV]” is the source and the “*first proximity-based reader device* [PNC/DEV]” is the destination of the CTA assigned for the communication. (See, e.g., INTEL-1005, 25, Figure 3-1, 56-57.)

178. The “*first/second*” DEV can also communicate with PNC/DEV by receiving data from the PNC/DEV and transmitting an acknowledgement message. (*Id.*, 25, Figure 3-1 (reproduced above with “*first/second*” DEVs annotated); see also *supra* §§IV.B.2.a, f (discussing bi-directional communication in piconet).) IEEE 802.15.3 further provides for an “[i]mmediate acknowledgment (Imm-ACK)” sent by a DEV within an assigned CTA “to confirm” receipt of a frame.

(INTEL-1005, 81-82; *see also* INTEL-1005, 94-95, Figure 4-17², 57 (“destination is only allowed to transmit the requested ACK frames, either Imm-ACK or Dly-ACK, during the CTA”), 177; INTEL-1006, 174 (“If an Imm-ACK or Dly-ACK is expected for that frame, the DEV shall check whether there is enough time remaining in the time slot to accommodate the current frame”).) I described the operation of the ACK in §§III.A.2.a.iii and IV.B.2.a above.

c) Claim Limitations [1A.2]/[1B.2]/[1D]

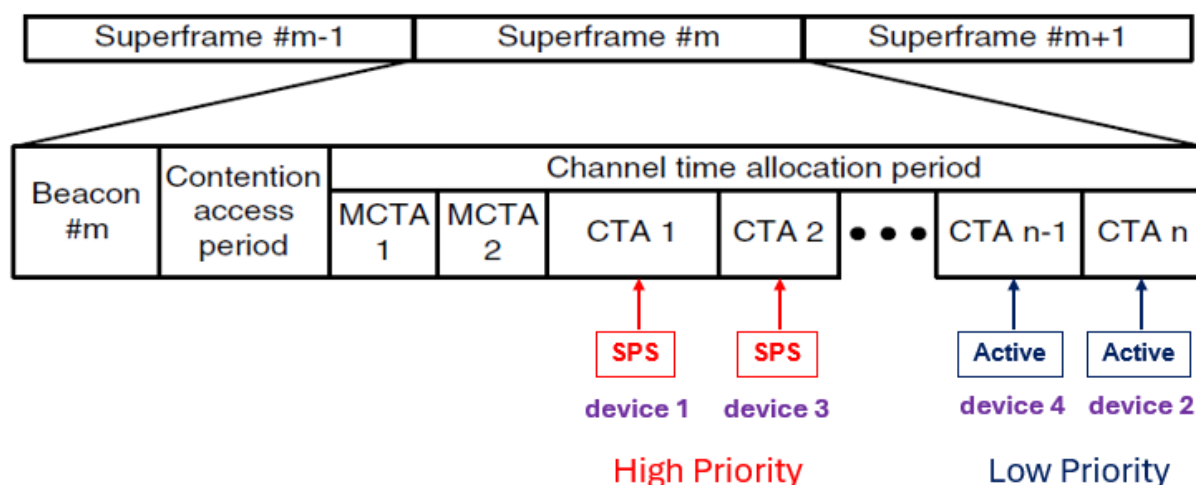
179. The combination of Gilb and 802.15.3 discloses “*the first specific time slot set according to a first class*” [1A.2], “*the second specific time slot set according to a second class*” [1B.2], and “*the first class is associated with one or more of the first client device and a user of the first client device, and the second class is associated with one or more of the second client device and a user of the second client device*” [1D] under PO’s interpretation of “*class associated with [device/user].*”

180. I note that the claim does not preclude the “*first class*” and “*second class*” from being the same (e.g., both SPS modes). The classes are still distinct in the manner recited because the “*first class*” under PO’s interpretation (e.g., SPS mode) is the class associated with a first device/user and the “*second class*” under

² “Total channel time request” reflects that the assigned CTA (red box) is equal to the channel time requested; the Imm-ACK (yellow) is shown within the assigned CTA. (INTEL-1005, 94-95.)

PO's interpretation (e.g., SPS mode) is the class associated with a second device/user. The Gilb-802.15.3 combination discloses or at least suggests two different CTA allocation algorithms performed by the PNC which each independently disclose these limitations under PO's construction. (*See supra* §IV.B.1.e.)

181. In the first, the PNC allocates CTAs based on PM status (i.e., SPS or non-SPS). (*See* INTEL-1006, 172 (“PNC should attempt **to allocate the CTAs of all SPS** [synchronized power save] **first**”).) As discussed in §IV.B.1.e.i, under PO's interpretation, the PM mode is the “*class*” and because it reflects a PM mode of the DEV, it is “*associated with ... the [first]/[second] client device*” under PO's interpretation. Accordingly, for the same reasons addressed for limitations [16D]-[16E], under PO's interpretation, the PNC allocates (sets) the “*first time slot*” (e.g., CTA 1) according “*to a first class*” (e.g., SPS mode) associated with the “*first client device* (device 1)” and allocates (sets) the “*second time slot*” (e.g., CTA n) according “*to a second class*” (e.g., ACTIVE mode) associated with the “*second client device* (device 2).” (§IV.B.1.e.i.)



802.15.3, Annotated Figure 2

182. In the second CTA allocation algorithm, Gilb suggests allocating CTAs according to QoS category. (*Supra* § IV.B.1.e; INTEL-1005, 258 (“PNC with a good **CTA algorithm** will be able to better maintain **the QoS** in [the] piconet and to provide greater overall throughput”).) As discussed in § IV.B.1.e.ii, under PO’s interpretation, the QoS category is the “*class*” and is associated with both the “*client device*” and the “*user of the client device*” under PO’s interpretation of the limitation. Accordingly, for the same reasons discussed for [16D]-[16E], under PO’s interpretation, the PNC allocates (sets) the “*first time slot*” (e.g., CTA 1) according “*to a first class*” (e.g., 6: Voice) associated with the “*first client device* (device 1)” and allocates (sets) the “*second time slot*” (e.g., CTA n) according “*to a second class*” (e.g., 5: Video) associated with the “*second client device* (device 2).”

d) Limitation [1C]

183. The combination of Gilb and 802.15.3 discloses “*the first and second specific time slots are determined based on synchronization information wirelessly received by the first and second client devices and priority level data associated with the first class and with the second class*” [1C] under PO’s interpretation of “*class associated with [device/user]*” and “*synchronization information.*”

184. The DEVs in the piconet each wirelessly receive the beacon (“*synchronization information*”) transmitted by the PNC under PO’s interpretation of “*synchronization information.*” (INTEL-1005, xv, 13, 25; INTEL-1006, 1 (standard for wireless connectivity), 192 (“Beacon reception”).) DEVs use the “superframe duration and the CAP end time in the beacon ... to accurately mark the beginning and the end of the CTAP.” (INTEL-1006, 192: *see also* INTEL-1005, 51-52; §IV.B.1.b-c.) The beacon contains a CTA IE with multiple CTA blocks, each of which has the source, destination, start time, and duration of the CTA (“*first and second specific time slots [e.g., CTA 1 and CTA n]*”). (*See* §IV.B.1.d.) When a DEV has been assigned a CTA as a source device, the DEV “shall use the beacon start time, CAP end time and the CTA IEs contained in the beacon to start their transmissions.” (INTEL-1006, 192.) Similarly, when a DEV has been assigned a CTA as the destination device, the DEV uses the beacon start time, CAP end time, and CTA IEs contained in the beacon to determine when to

turn on its receiver. (INTEL-1005, 40, 56, 101, 103-104; INTEL-1006, 192.) Thus, each DEV (“*client device*”) uses information in the beacon (“*synchronization information*”) to determine the specific CTA (“*time slot*”) assigned to it for transmission or reception, under the PO’s interpretation of “*synchronization information*.” The combination of Gilb and 802.15.3 therefore renders obvious “*the first and second specific time slots are determined based on synchronization information wirelessly received by the first and second client devices ...*” [1C].

185. As discussed in §IV.B.1.e, in the PM mode allocation technique, the SPS mode (“*first class*”) has a higher priority for CTA allocation than the non-SPS mode (“*second class*”), and the CTA allocations are determined according to “*priority level data*” associated with the PM mode “*class*” under the PO’s interpretation of the “*class associated with [device/user]*” term.

186. In the QoS allocation technique discussed in §IV.B.1.e.ii, each QoS category is associated with a priority level (“*priority level data*”) (e.g., “*class*” of isochronous voice (VO) has priority of 6, which is highest priority and the “*class*” of best effort (BE) has a priority of 0). That is, the QoS allocation algorithm associates a “*first class*” and a “*second class*” with “*priority level data*” under the PO’s interpretation of the “*class associated with [device/user]*” term.

187. Thus, in both allocation techniques, the combination of Gilb and 802.15.3 discloses that “*the first and second specific time slots are determined*

based on ... priority level data associated with the first class and with the second class” under the PO’s interpretation of the “*class associated with [device/user]*” term.

C. Dependent Claims

1. Claim 2

188. The combination of Gilb and 802.15.3 discloses claim 2 which I reproduce below.

2. The method of claim 1, further comprising:

dynamically adjusting at least one of the first specific time slot and the second specific time slot.

189. Gilb in combination with 802.15.3 discloses “*dynamically adjusting*” CTAs (“*time slots*”) in at least two ways: (1) by changing the location of an assigned CTA within the CTAP or (2) by modifying the channel time allocated.

190. IEEE 802.15.3 supports the ability for a PNC to alter the location of an assigned CTA (“*first*” or “*second*” “*specific time slot*”) in the CTAP. IEEE 802.15.3 describes “two types of CTAs: dynamic CTA and pseudo-static CTA.” (INTEL-1006, 172.) Pseudo-static CTAs are “allocated only for isochronous streams” whereas dynamic CTAs are “used for both asynchronous and isochronous streams.” (*Id.*) My discussion focuses on pseudo-static CTAs, but dynamic CTAs are equally applicable, as the PNC/DEV may “move dynamic CTAs within the

superframe on a superframe by superframe basis” by “changing the CTA parameters in the beacon.” (INTEL-1006, 172.)

191. A pseudo-static CTA is maintained in the same location across superframes (e.g., DEVs 1 and 2 are assigned a pseudo-static CTA at location CTA 1 in each superframe, shaded yellow, and DEVs 3 and 4 are assigned a pseudo-static CTA at location CTA 2 shaded blue, as shown below in the figure). (INTEL-1005, 59.) “The PNC is allowed to change the location of a pseudo-static CTA, but it needs to take care to ensure that enough time is allowed for the source and destinations of the pseudo-static CTAs to see the change in the allocation before it is given to another device.” (*Id.*) That is, the PNC can dynamically adjust the location of a pseudo-static CTA within a superframe with advanced notice to DEVs. As described by Gilb, “[w]hen the source DEV sees the new allocation in the beacon, it begins using the new allocation for its transmissions,” as shown in the figure below which adjusts the location of the pseudo-static CTA assigned to DEV 3/4 from CTA 2 to CTA n. (*Id.*)

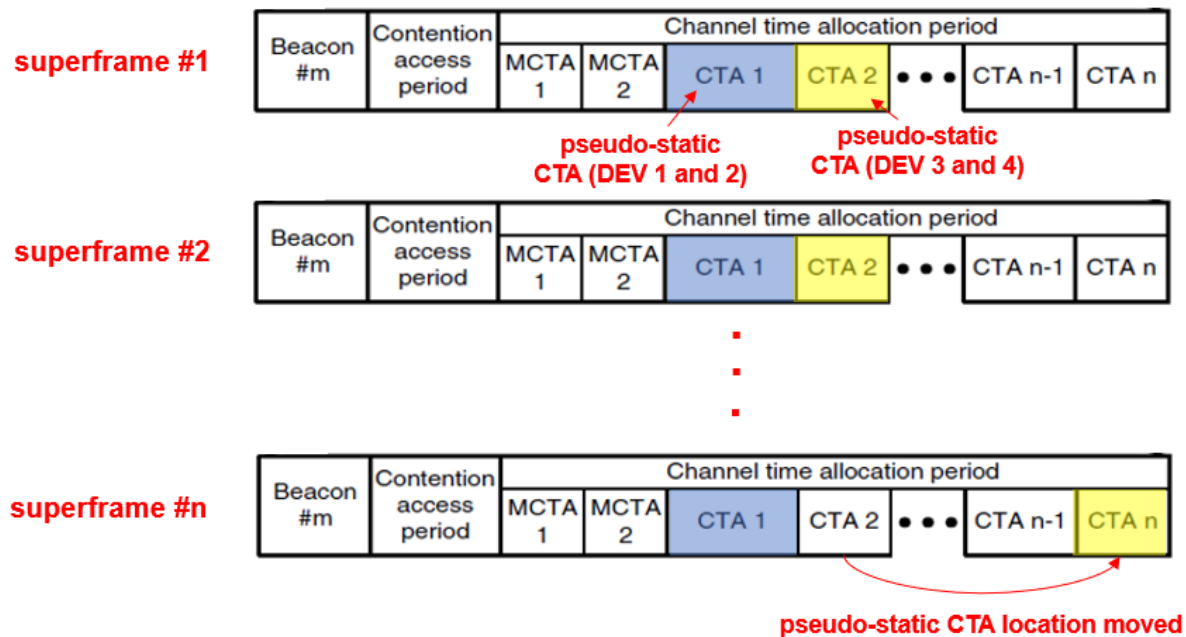


Figure B (Annotating Figure 2 for Multiple Superframes)

192. Additionally, a DEV or PNC/DEV “may modify an established isochronous stream” by sending a channel time request (CTRq) requesting the modification. (See INTEL-1005, 36; INTEL-1006, 183, 139 (providing format of channel time request), Figure 73.) Allowable modifications include adjusting the duration of the CTA by, e.g., increasing or decreasing number of time units for the CTA. (See INTEL-1006, 183; INTEL-1005, 92-94, Figure 4-16 (showing multiple time units per CTA).)

193. Thus, the combination of Gilb and 802.15.3 discloses “*dynamically adjust[s] at least one of the first specific time slot and the second specific time slot.*”

2. Claim 5

194. The combination of Gilb and 802.15.3 discloses claim 5 which I reproduce below:

5. The method of claim 1, wherein the first class comprises at least one of a user associated with the first client device and a class of the first client device

195. Claim 5 recites “*the first class comprises at least one of a user associated with the first client device and a class of the first client device,*” whereas claim 1 recites “*the first class is associated with*” either the user or the device. As explained in §IV.B.1.e, IV.B.3.c, the combination of Gilb and 802.15.3 discloses the “*class*” comprises “*a class of the first client device*” under PO’s interpretation of “*class associated with [device/user]*” in the PM status allocation because the “*class*” is the device’s PM mode (SPS or non-SPS).

3. Claim 6

196. The combination of Gilb and 802.15.3 discloses claim 6 which I reproduce below:

6. The method of claim 1, wherein assigning the first specific time slot is dependent on a network traffic load.

197. The combination of Gilb and 802.15.3 disclose two ways in which the “*assigning the first specific time slot is dependent on a network traffic load.*” First, when a DEV in the piconet has data to transmit, it sends a channel time request

(CTRq) to the PNC. (INTEL-1005, 35-36; INTEL-1006, 139-40.) In a piconet with multiple DEVs, the PNC receives multiple CTRqs. The time slots the PNC allocates are “*dependent on*” the received CTRqs, which are indicative of the anticipated “*traffic load*” on the network. (INTEL-1006, 173.) For example, when relatively few or no time slots are requested—i.e., the network traffic load is low—each user would receive earlier and/or more time slots because there would be less/no competition for those time slots, whereas when more time slots are requested—i.e., the network traffic load is high—the users would receive fewer and/or later time slots to accommodate the increase in network traffic.

198. Second, 802.15.3 explains that the PNC assigns time slots “based on the current pending requests from all the DEVs and the currently available channel time” (i.e., available time slots). (INTEL-1006, 173.) If no time slots are available, the PNC can defer assignment until one becomes available in a future superframe (i.e., the requested “*network traffic load*” decreases). (INTEL-1005, 89). That is, when a time slot opens up (“dependent on a “*network traffic load*”), the PNC assigns the available (“*first specific*”) “*time slot*.”

199. Thus, in both examples, the PNC assigns the time slot(s) based on SPS/QoS as I discussed above in §IV.B.1.e, IV.B.3.c.

4. Claim 7

200. The combination of Gilb and 802.15.3 discloses claim 7 which I reproduce below:

The method of claim 1, further comprising:

reassigning the first specific time slot to a third client device in response to a detection that the first client device is unavailable.

201. A DEV “ceases to be a member of the piconet because it requests to leave, the PNC tells it to leave, or through inactivity in the piconet.” (INTEL-1005, 35, 79-80.) As I discussed in §III.A.2.a.ii, the termination of a DEV’s membership in a piconet is accomplished through the disassociation process. (INTEL-1005, 35, 41, 79-80; *see also* INTEL-1006, 168.) One example provided by Gilb of a DEV “leaving the piconet” is when the DEV moves out of range of the PNC. This occurrence triggers disassociation of the DEV from the piconet. (INTEL-1005, 79-80; *accord* INTEL-1001, 15:67-16:3 (“once a specific client exits the network, previously reserved time slots of that client may be reassigned to one or more other client devices”).) When a DEV leaves (exits) the piconet, it is “*unavailable*” for receiving/transmitting data within the piconet. (INTEL-1006, 11; *See* INTEL-1001, 15:67-16:3 (’129 patent’s sole disclosure of reassigning time slots states “it is noted that once a specific client exits the network, previously reserved time slots of that client may be reassigned to one or more other client devices in the network”).)

202. For example, in IEEE 802.15.3, the PNC detects when a DEV has not successfully sent a frame to the PNC during a predetermined period (referred to as the association timeout period (ATP)) and disassociates the DEV from the piconet. (INTEL-1005, 35, 41 (“If the PNC does not hear from a DEV at least once every ATP, it assumes that the DEV has disappeared and the PNC disassociates the DEV”); INTEL-1006, 168 (“If the PNC does not receive any frame originating from an associated DEV within this timeout duration, the PNC shall disassociate the DEV”).) The failure of the “*first client device*” to send data is an indication that the “*first client device is unavailable*” (e.g., has exited the piconet by turning off or leaving the coverage area). (INTEL-1005, 80 (“it is possible or even likely that DEVs will move out of range of the PNC”).)

203. An existing CTA allocation is terminated in IEEE 802.15.3 when a DEV disassociates from the piconet. (See, e.g., INTEL-1006, 168 (PNC “shall perform the stream termination procedures for each of the assigned CTAs with the disassociated DEV as the SrcID or DestID), 186-87 (describing process for terminating CTA allocations); INTEL-1005, 36 (describing termination of an isochronous allocation), 91 (terminating asynchronous allocations due to disassociation).) A POSITA would have understood that when a CTA allocation (“*first specific time slot*”) to the “*first client device*,” such as a pseudo-static CTA for isochronous data, is terminated, the “*first specific time slot*” associated with

that CTA is available for reallocation to a different source/destination DEV pair. (INTEL-1006, 172 (“the PNC may reuse the old [pseudo-static] allocation for another pair of DEVs”); *see* §III.A.2.a.iv.) I have illustrated this sequence in the figure below. In the first and second superframe, CTA 1 and CTA 2 are pseudo-static allocations. Subsequently, DEV 1 becomes unavailable, terminating the allocation of CTA 1, as shown in superframe #n-1 where the CTA is unassigned.

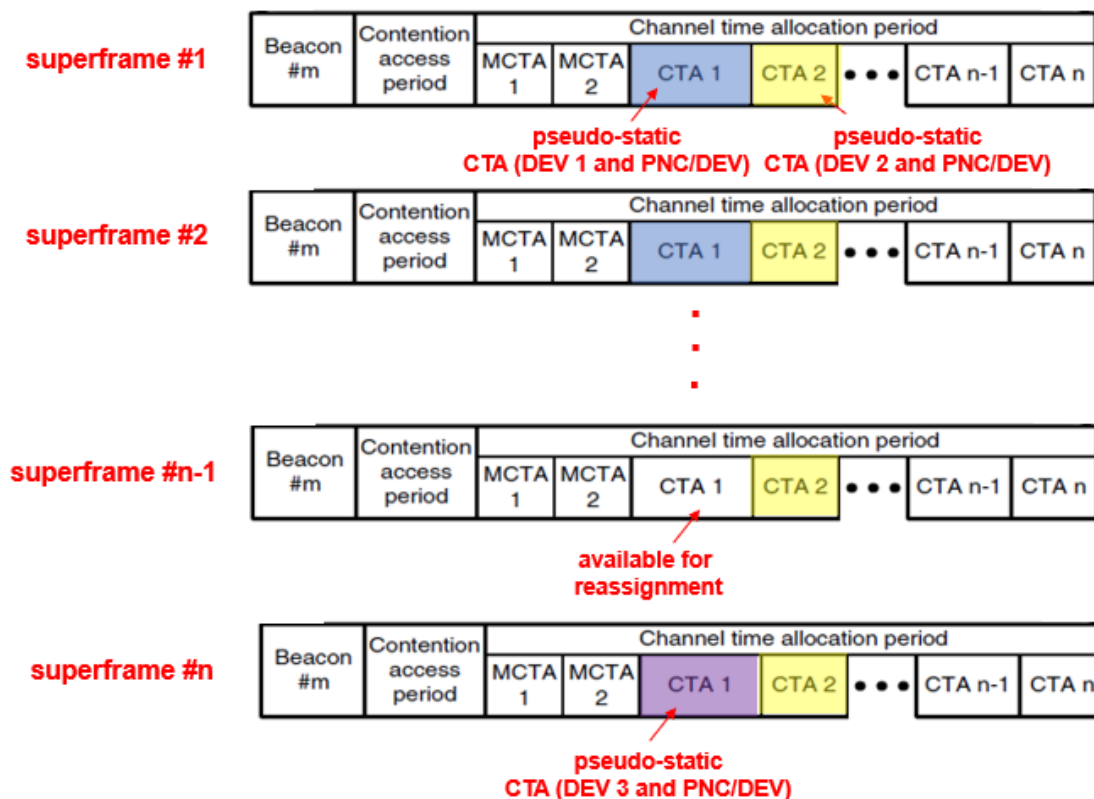
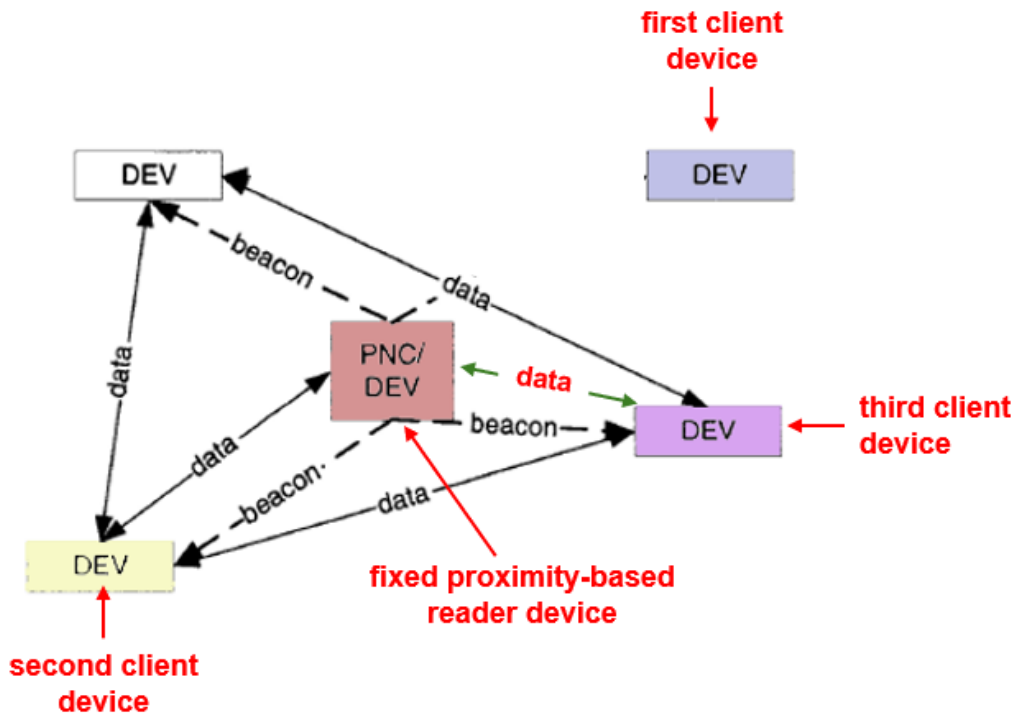


Figure C

204. As discussed in §IV.C.3, the PNC assigns CTAs “based on the current pending requests from all the DEVs and the currently available channel time within the CTAP.” (INTEL-1006, 173.) Another device in the piconet (“*third client*

device”) that has data to receive or send, such as depicted in annotated Gilb, Figure 3-1 below (INTEL-1005, 25), requires a CTA assignment for the data transmission. As shown in this annotated figure, DEV 1 has become unavailable. As explained by 802.15.3, when allocating CTAs for isochronous CTRqs, “[i]f the Available Number of” time units (“TUs”) assigned to the “requested isochronous stream” is greater than or equal to the Minimum Number of TUs requested and less than or equal to the Desired Number of TUs requested”, the CTA is assigned to the request (i.e., the requested “*time slot*” fits within the available CTA). (See INTEL-1006, 141.) However, if the “Available Number of TUs” is “less than Minimum Number of TUs requested,” the requesting DEV is informed in the Channel Time Request that the “PNC is unable to fulfill the DEV’s request.” (*Id.*) In this case, “the Available Number of TUs will be set by the PNC to the number of TUs that the PNC would have been able to allocate for this request.” (*Id.*) The requesting DEV can then “modify its original request parameters” (i.e., make a request that “fits within” the available CTA). (*Id.*, 181.)



Gilb, Annotated Figure 3-1

205. These disclosures from 802.15.3 teach or at a minimum suggest to a POSITA that a CTA (“*first specific time slot*”) originally assigned to the “*first client device*,” as mapped in §IV.B.1.d, which is deallocated is “*reassigned*” (i.e., reallocated) to a new source/destination pair (i.e., a pair including a “*third client device*”) in the piconet, as illustrated in Lansford Figure C above, when the PNC has a request for a CTA that matches the duration of the *first specific time slot* that had been assigned to the now disassociated, unavailable *first client device*. When a DEV becomes disassociated from the piconet, its data connections are unavailable for sending traffic and here, the PNC/DEV has reassigned CTA 1 to DEV 3 for exchanging data with the PNC/DEV.

V. GROUND 2: Claims 12, 13, and 15 Are Obvious Based on the Combination of Gilb, 802.15.3, and Cai.

206. The Gilb-802.15.3 combination renders claims 1, 16 and 18 obvious. However, neither Gilb nor 802.15.3 explicitly disclose “*the client device storing a bit field identifying a specific time slot*” [12C]. While this limitation would have been obvious to a POSITA based on the disclosures of Gilb and 802.15.3, the paper “A Novel Design of IEEE 802.15.3 MAC over UWB” to Cai, et al. (“Cai”) expressly discloses this limitation.

A. Overview of the Combination

1. Cai

207. The “main purpose” of Cai is “to implement an efficient 802.15.3 MAC over UWB.” (INTEL-1008, 5297.) Cai explains that traditionally, the “MAC controller performs the whole MAC functions and is implemented in hardware as a single chip on a NIC [network interface card]” as shown at top in Cai’s Figure 1 below. Cai, however, splits “the MAC into two parts according to different timing requirements, namely, upper layer MAC (UMAC) which is responsible for non-timing-critical functions and lower layer MAC (LMAC) which needs to respond to events in real time.” (*Id.*) In Cai’s design, the LMAC is “left in the NIC built in hardware, while UMAC is implemented in OS driver,” as shown at bottom below. (*Id.*)

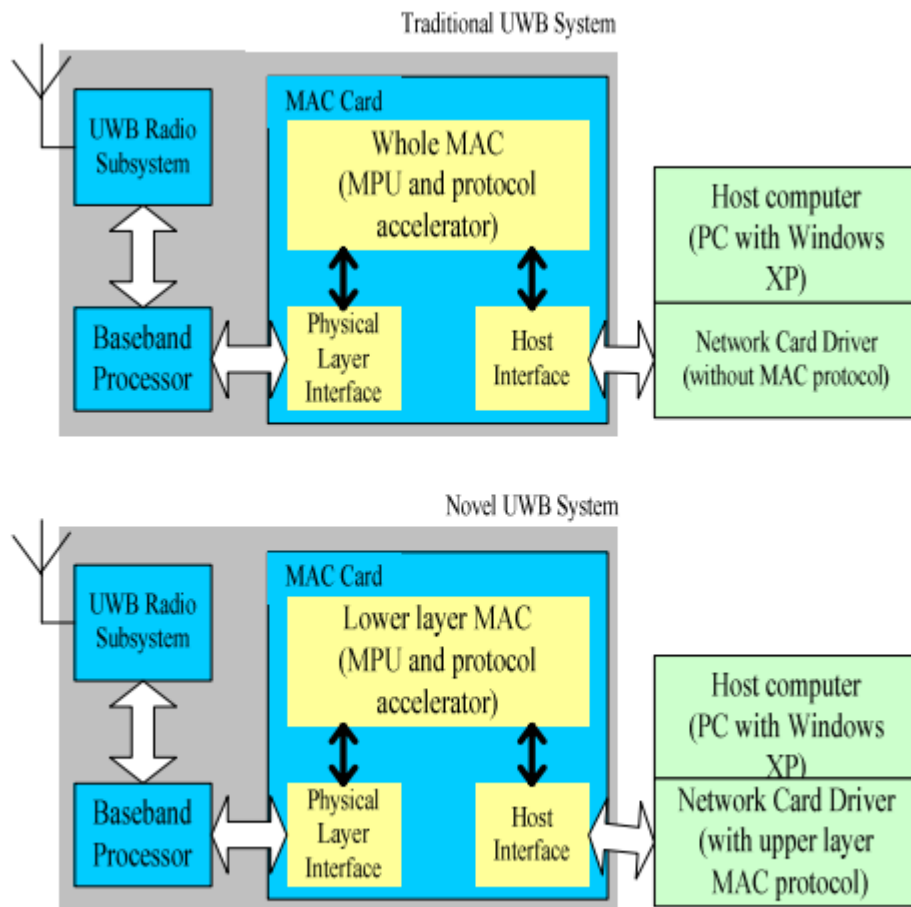


Figure1 Traditional and our proposed UWB system

208. Cai's LMAC is shown in Figure 5, reproduced below. The LMAC includes a Tx/Rx Scheduler that "is a set of hardware module [sic] which accelerates the transmission and reception of MAC MPDU under the control of firmware." (*Id.*, 5300.) The Tx/Rx Scheduler "contains some status registers which may be read or set by firmware and they can trigger hardware action to complete the frame transmission and reception." (*Id.*)

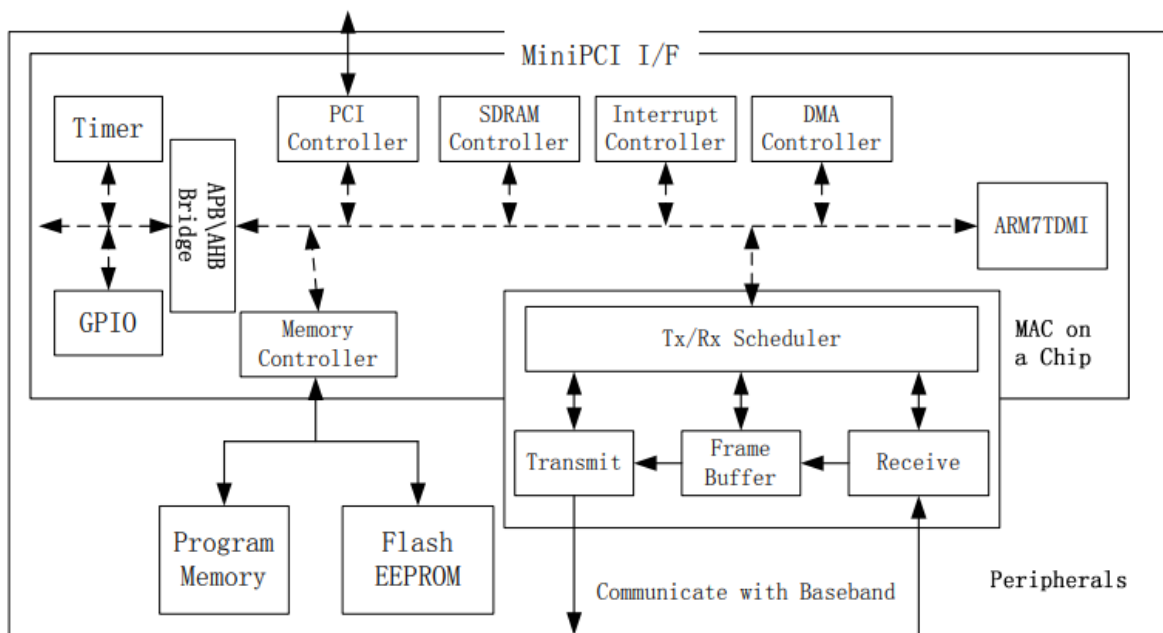


Figure 5 LMAC hardware architecture based on ARM

Cai, Figure 5

209. “When a beacon frame arrives, the protocol accelerator will generate an interrupt to ARM and interrupt routine will send certain instruction to it,” then “Tx/Rx scheduler can extracts [sic] all the information in beacon in real time and reset[s] **the status of the LMAC** such as CAP starting time and duration.”

(INTEL-1008, 5301.) For example, the firmware determines when the DEV’s CTA arrives and sends an enabling instruction to the scheduler. (*Id.*, 5300.) When a frame is sent, the scheduler informs the firmware which computes “the residual time left in the CTA to avoid current communication going beyond the allocated CTA.” (*Id.*)

2. Motivation to Combine

210. A POSITA would have been motivated to combine Cai's teaching regarding use of a MAC hardware accelerator with the DEV of Gilb and 802.15.3.

211. Cai, like Gilb and 802.15.3, is in the same field as the '129 patent (network, encompassing wireless, communications). Cai, Gilb, and 802.15.3 each describe 802.15.3 which is a wireless protocol. (*See supra* §§IV.A.1, IV.A.2, V.A.1.) The '129 patent is also directed to wireless network communications. (*Supra* §III.B.)

212. Gilb motivates the combination noting that the "MAC is split into hardware and software" and referring to the precise structure being left for the product implementer. (INTEL-1005, 262.) Cai provides a split hardware/software MAC like described by Cai. Cai also motivates the combination describing four benefits of its design:

- Low Cost: With only timing critical functions such as synchronization or beacon generation left in NIC, the powerful embedded CPU acting as MAC controller can be replaced by a less powerful and much cheaper MPU. Thus the cost of the UWB NIC can be greatly reduced.
- Flexibility: It is more flexible to upgrade various management algorithms by only modifying the driver than replacing a new NIC as traditional design does.
- Scalability: We can dynamically load MAC function modules depending on different NIC function requirements. So, it can be adaptive for different environments.

- Testability: In addition to the upper layer MAC protocol, we can allow code extensions in the driver with useful statistical information which would be useful for further analysis, testing and debugging of the system.

(INTEL-1008, 5297.)

213. Consistent with the suggestions of Gilb and Cai, a POSITA would have been motivated to use Cai's two-layer MAC in the DEVs of Gilb-802.15.3 to obtain a flexible implementation which is more cost effective. The results of the combination would have been predictable and a POSITA would have had a reasonable expectation of success because, as Gilb recognizes, it was known to implement 802.15.3 MAC functionality in hardware. (INTEL-1005, 262.)

B. Independent Claim 12

214. Claim 12 recites:

[12P] A system, comprising:

[12A] a network device arranged to wirelessly broadcast synchronization information in a first wireless coverage range; and

[12B] a portable device for wirelessly communicating data with a reader device when the client device is located in communication proximity of the reader device

[12C] the client device storing a bit field identifying a specific time slot

[12D] the specific time slot set according to a class associated with the one or more of the portable client device and the user of the portable client device.

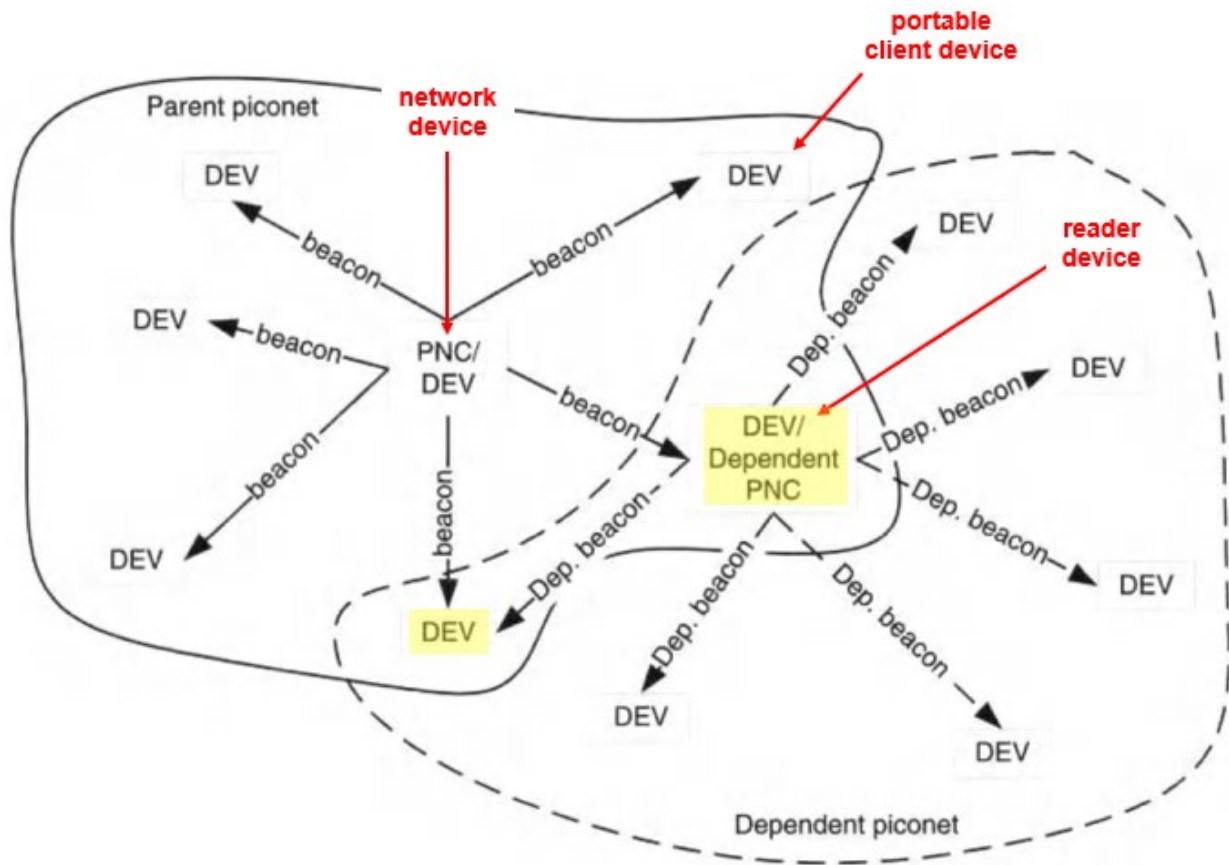
[12E] the client device is arranged to receive data from the network device during the specific time slot

[12F] the time slot determined based on the synchronization information and priority level data associated with the class.

1. Preamble [12P]/System Components

215. The combination of Gilb, 802.15.3 and Cai discloses a “*system*” comprising “*a network device,*” “*a portable client device,*” and “*a reader device.*”

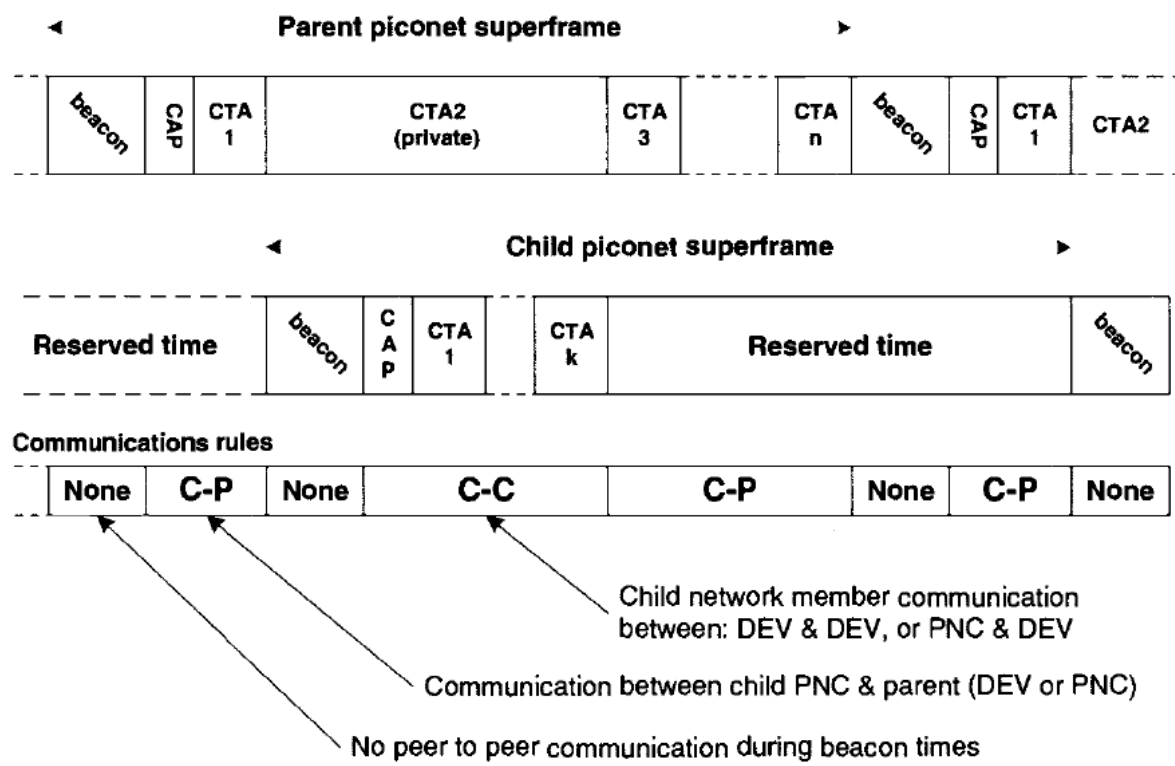
216. IEEE 802.15.3 supports dependent piconets, illustrated in Figure 3-3 below, which “rely on the parent piconet for their channel time and synchronization.” (INTEL-1005, 27, 36-37.) One type of dependent piconet is a child piconet “used to extend the range of the original piconet by using the child PNC as a bridge to other DEVs.” (*Id.*, 28.) The parent and dependent/child piconets are collectively a “*system.*”



Gilb, Annotated Figure 3-3

217. As shown above, a DEV (shaded yellow) can be a member “of both the parent and dependent [child] piconets.” (INTEL-1005, 26.) In this arrangement, “the DEV would need to keep track of two separate personalities, one as a DEV in the parent piconet and the second as a DEV in the dependent piconet.” (*Id.*) One device (the “DEV/Dependent PNC”) in the parent piconet “request[s] channel time from the PNC to become the PNC” of a dependent piconet. (*Id.*) That is, the parent PNC allocates a CTA during which the dependent piconet operates. (*See, e.g., id.*, 171-72.) Figure 5-2 (below) from Gilb illustrates the relationship of the parent and

child superframes. (*Id.*, 172.) A child PNC transmits its own beacon in the CTA allocated by the parent PNC and assigns CTAs for its dependent piconet within its allocated CTA of the parent network. As shown in Figure 5-2 below, “there are times during the parent superframe when the child PNC can communicate with the parent PNC or with other DEVs in the parent piconet” which are marked with “C-P.” (*Id.*, 171.) The blocks of time marked by C-C are designated for communication between members of the child network. (*Id.*, 171-72.)



Gilb, Figure 5-2

218. As I discussed in §IV.B.1.b, the PNC of the parent network is a “*network device*” within the parent piconet. Any DEV in the parent piconet that is

not currently acting as the PNC of the parent or child network is the recited “*portable client device*” for the same reasons I discussed in §IV.B.1.c.

219. The DEV/dependent PNC controls access to the dependent/child piconet by accepting or rejecting association requests received (read) from DEVs within the dependent piconet, so it is a “*reader device*” for the same reasons discussed in §IV.B.3.b. (*See, e.g.*, INTEL-1001, 5:24-28, 7:23; INTEL-1005, 37, 165-167; INTEL-1006, 11.)

2. Limitation [12A]

220. The combination of Gilb, 802.15.3, and Cai discloses “*a network device arranged to wirelessly broadcast synchronization information in a first wireless coverage range*” [12A] under PO’s interpretation of “*synchronization information*.”

221. As discussed for limitation [16A], the PNC/DEV of the parent piconet (“*network device*”) is “*arranged to wireless broadcast synchronization information*” under PO’s interpretation. The “extent of the piconet is determined by the ability of DEVs to **hear the beacon transmitted by the PNC.**” (INTEL-1005, 25; INTEL-1006, 8.) A POSITA would have understood the extent to which DEVs “hear the beacon” represents the wireless coverage area or “*wireless coverage range*” of the PNC/DEV of the parent piconet (“*network device*”). (*See* INTEL-

1005, 3 (defining “coverage area” as the “area where two 802.15.3 devices are able to exchange messages with acceptable quality and performance”).)

3. Limitation [12B]

222. The combination of Gilb, 802.15.3 and Cai discloses “*a portable device for wirelessly communicating data with a reader device when the client device is located in communication proximity of the reader device*” [12B].

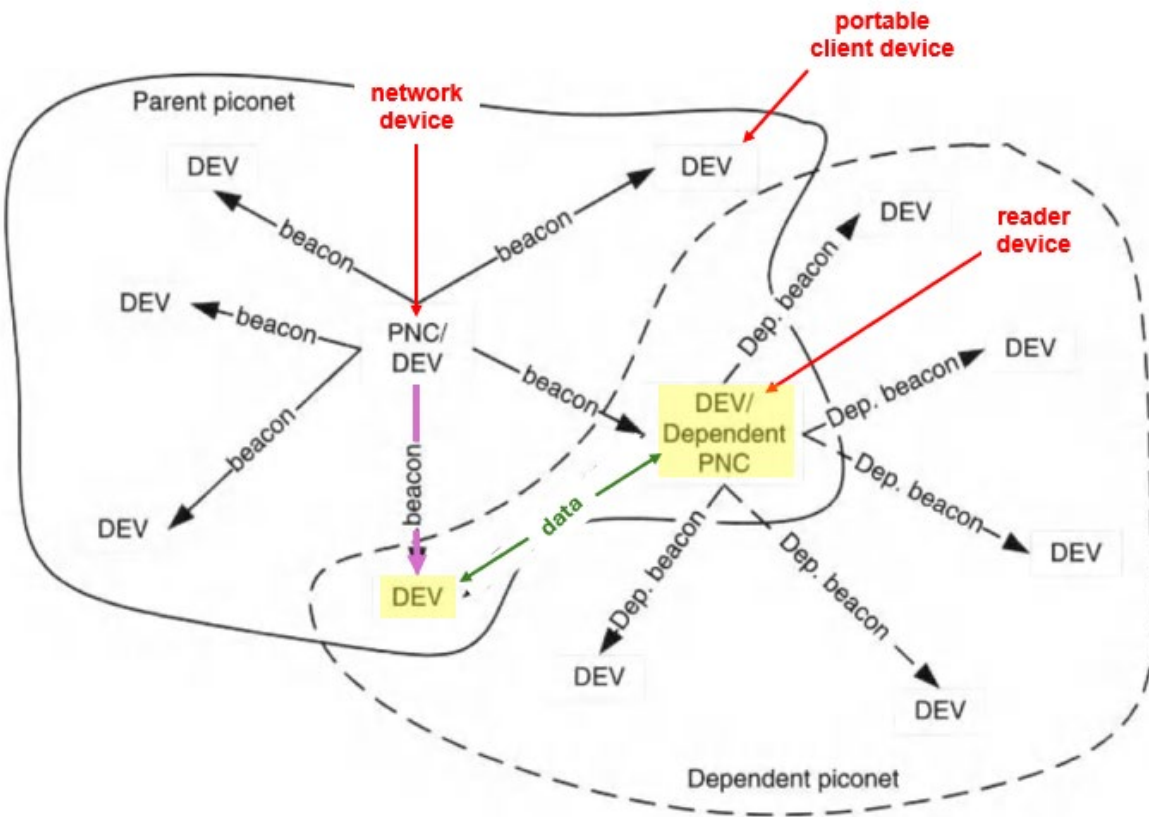
223. As discussed in §§IV.B.1.a, IV.B.2.a, an IEEE 802.15.3 piconet is a wireless system allowing “independent data devices (DEVs) to communicate with each other.” (See INTEL-1005, 25; INTEL-1006, 8.) Because the “*portable device*” is any non-PNC DEV in the parent piconet and the DEV/dependent PNC is also a DEV in the parent piconet, the “*portable device wirelessly communicat[es] data with the reader device,*” e.g., during the CAP (INTEL-1005, 33) or in a CTA in the CTAP assigned to a DEV and the DEV/dependent PNC. (*Id.*, 33-34). And as discussed above (*supra* §IV.B.3.b.1 and V.B.2), IEEE 802.15.3 DEVs are able to “exchange messages” within the coverage area (“*communication proximity*”) of one another. (INTEL-1005, 3.) That is, the DEV and DEV/dependent PNC “*wirelessly communicat[e] data ... when the client device [DEV] is located in communication proximity of the reader device [DEV/dependent PNC].*”

4. “*Time Slot*” Limitations [12C]-[12D], [12F]

224. The combination of Gilb, 802.15.3, and Cai renders obvious “*the client device storing a bit field identifying a specific time slot*” [12C], “*the specific time slot set according to a class associated with the one or more of the portable client device and the user of the portable client device*” [12D], and “*the time slot determined based on the synchronization information and priority level data associated with the class*” [12F] under PO’s interpretation of “*class associated with [device/user]*” and “*synchronization information.*”

225. As discussed in §IV.B.1.d for “*assigning a specific time slot*” and §IV.B.1.b for “*wirelessly broadcasting data*”, the PNC/DEV assigns a CTA within its superframe for “*wirelessly communicating data*” between a source/destination DEV pair within the piconet, during which the client device (destination) can receive data from the network device (source). As discussed in §IV.B.1.c, the PNC broadcasts the assigned CTA in a CTA block in the beacon (“*synchronization information*”; shaded purple in Figure 3-3 below), as construed by PO. The CTA block identifies “*a specific time slot*” (start time and duration of the CTA) for communication between a source/destination DEV pair (shaded green). (*See supra* §IV.B.1.d.) A POSITA would have understood that the CTA block is specified using bits, and therefore, the “*specific time slot*” is identified by “*a bit field.*”

(INTEL-1006, 101 (showing a frame consists of bits), 117 (showing CTA blocks consisting of octets (8 bits))); INTEL-1005, 47 (“octet” refers to “8 bits of data”).)



Gilb, Annotated Figure 3-3

226. The combination of Gilb, 802.15.3, and Cai uses Cai’s two-layer MAC architecture in the Gilb-802.15.3 DEV. (§V.A.2.) In its architecture, “[w]hen a beacon frame arrives, the protocol accelerator will generate an interrupt to ARM,” and the Tx/Rx scheduler of the hardware LMAC “extracts all the information in beacon in real time and reset[s] the status of the LMAC such as CAP starting time and duration.” (INTEL-1008, 5301.) The LMAC “contains some status registers which may be read or set by firmware and they can trigger

hardware actions to complete the frame transmission and reception.” That is, the extracted data such as CTA location and duration is stored in the status registers and used to determine, e.g., information needed for transmission or reception. (*See, e.g., id.*, 5300-5301.) For example, the firmware, using the extracted and stored CTA data, determines when the DEV’s CTA arrives and sends an enabling instruction to the scheduler. (*Id.*, 5300.) When a frame is sent, the scheduler informs the firmware which computes “the residual time left in the CTA to avoid current communication going beyond the allocated CTA.” (*Id.*) A POSITA would have understood this calculation is made using at least the extracted and stored CTA duration information. Because the “*specific time slot*” is transmitted as a “*bit field*,” a POSITA would have understood that the “*client device stor[es] a bit field identifying a specific time slot*” in the status registers, as taught by Cai.

227. As discussed in §IV.B.3.c, the combination of Gilb and 802.15.3 discloses “*the specific time slot set according to a class*” which is “*associated with the one or more of the portable client device and the user of the portable client device*” [12D] under PO’s interpretation of “*class associated with [device/user]*.”

228. And as discussed in §IV.B.3.d, “*the time slot determined based on the synchronization information and priority level data associated with the class*” [12F] under PO’s interpretation of “*synchronization information*.”

5. Limitation [12E]

229. For the reasons discussed in §IV.B.1.d for limitation [16C], the Gilb-802.15.3-Cai combination further discloses “*the client device is arranged to receive data from the network device during the specific time slot*” [12E].

C. Dependent Claims

1. Claim 13

230. The combination of Gilb, 802.15.3, and Cai discloses “*the client device is further arranged to transmit data to the network device during the time slot.*” As discussed in §IV.B.3.b, a DEV sends an “[i]mmediate acknowledgment (Imm-ACK)” within an assigned CTA “to confirm” receipt of a frame. (INTEL-1005, 81-82; *see also* INTEL-1005, 94-95, Figure 4-17, 57 (“destination is only allowed to transmit the requested ACK frames, either Imm-ACK or Dly-ACK, during the CTA”), 177.) Accordingly, when the “*client device*” receives a data frame from the “*network device*”, it transmits an ACK frame (“*data*”) to the “*network device during the time slot.*”

2. Claim 15

231. The Gilb-802.15.3-Cai combination discloses “*the synchronization information is dependent on at least one of a user associated with the client device, a class of a user associated with the client device, a class of the client device, and*

a network traffic load in the system” under PO’s interpretation of “class associated with [device/user]” and “synchronization information.”

232. As explained in §IV.C.2, the Gilb-802.15.3 combination discloses the “class” comprises at least “*a class of the first client device*” [5] in the PM status allocation and QoS allocation, under PO’s interpretation. Further, because the beacon (“*synchronization information*”) contains the CTA allocations (assigned “*time slots*”), which are set according to a “class” associated with the “*client device*” (see §§IV.B.1.d-e), the Gilb-802.15.3-Cai combination discloses the “*synchronization information is dependent on ... a class of the client device*” under PO’s interpretation. In addition, for the reasons described above for claim 6 (see *supra* §IV.C.3), the “*synchronization information*” containing the time slots is also dependent on “*a network traffic load in the system.*”

VI. GROUND 3: Claims 1, 2, 5-7, 16, and 18 Are Obvious Over the Combination of Gilb, 802.15.3, and Ward

233. The combination of Gilb, 802.15.3, and Ward renders claims 1-2, 5-7, 16 and 18 obvious under Petitioner’s construction of “*class associated with [device/user]*” and PO’s interpretation of “*synchronization information.*”

A. Combination Overview

1. Ward

234. WO 02/067009 to Ward et al., (“Ward,” INTEL-1007), like Gilb and 802.15.3, is directed to techniques for providing time slot assignments. (INTEL-

1007, 4-5 (providing “a time-division multiplex communication system comprising a scheduler for scheduling a plurality of messages for transmission.”).) Ward describes various applications for these time slots, including location tracking systems (where users receive time slots to provide location updates) and stock price update systems (where users receive stock price updates in assigned time slots). (*Id.*, 4-5, 12-13.) In particular, Ward describes prioritizing time slot assignments for certain users over others based on (1) users that pay more for their subscription in order to receive more frequent or immediate stock updates and/or (2) priority request messages sent from a user to the coordinator (scheduler). (*Id.*, Abstract, 12-13.)

235. Ward’s user subscription-based time slot prioritization can be used, for example, in a system that delivers stock share prices to users in assigned time slots. (*Id.*, 12 (“A particular example of such a communication system is a system which delivers share price information from a base station to pagers owned by subscribers over an asynchronous time division multiplex radio channel. Each pager has a unique address and each time slot contains the address of a pager and the current share price information for the associated subscriber.”)) Thus, users who pay more are given priority for time slot assignments. (*Id.*)

236. In one example, users can pay more to be placed in a higher “level of subscription.” (*Id.* (“Day traders can pay a higher subscription so as to be informed

more often of their current share prices and a scheduling process allocates time slots on the radio channel to investors based on the level of subscription paid by such investors so as to ensure fair allocation of the system resources.”)) These users are prioritized by receiving time slot assignments **more often** than users in a lower subscription level—in other words, higher priority users might receive stock price updates every few seconds, whereas lower priority users might receive updates every few minutes. (*Id.*) In another example, users can pay more for a premium service under which they receive **immediate** notifications when certain events occur, such as when their stock falls below a threshold price. (*Id.*, 12-13 (“It is possible to offer a premium service, which may not be available for everyone but which may be made available to nervous small-scale traders who wish to take advantage of a stock-crash feature and for which they pay a small additional fee. Thus, if the value of a stock in an investor’s portfolio falls to less than, for example, half of what they paid for it, the scheduler allocates the next available time slot to that investor so that they may be informed of a market catastrophe with minimal latency, thus allowing the investor to sell the investment immediately.”))

2. Motivation to Combine

237. As discussed in §IV.B.1.e, both Gilb and 802.15.3 require an algorithm to assign time slots. The combination of Gilb and 802.15.3 teaches prioritizing time slot assignments according to PM mode (and suggest QoS-based

allocation) (*see supra* §IV.B.1.e), but expressly contemplates the use of alternative, and even more complex, techniques for assigning time slots. (INTEL-1005, 93 (noting “there are undoubtedly many good algorithms” but no one was sufficiently acceptable to all to warrant adoption in the standard), 258 (standard setting “[g]roup wanted to keep the CTA algorithm as an implementation dependent function” because “[t]he ‘correct’ algorithm depends on the type of traffic that the PNC expects to support, the level of complexity that can be supported by the price of the implementation, and so on.”)); INTEL-1006, 173 (“[A]lgorithm used to allocate the channel time and assign CTAs is outside of the scope of this standard.”)) A POSITA would have been motivated to use the teachings of Ward—which discloses one such technique for assigning time slots—in order to prioritize users who pay more to receive more/better services. Prioritizing based on device PM mode or the type of data (QoS) does not allow users to pay more to get faster or more service—time slots depend on the device PM mode or data that the user is sending, rather than who the user is. Ward’s subscription/premium service options, however, allow users to pay more to get better or more service. By incorporating the teachings of Ward, a POSITA assigning time slots using Gilb and 802.15.3 could offer higher-level/premium subscribers **more** time slots and/or **immediate**

time slots in exchange for higher subscription/premium fees³. For example, users could pay more to receive immediate notification when a significant stock price drop occurs. (INTEL-1007, 12-13.) A POSITA would have been motivated to make this combination for a number of reasons.

238. Ward is in the same field as the challenged claims (networks, encompassing wireless communication) and is reasonably pertinent to the same purported problems addressed in the '129 patent (how to structure communications between devices in a network) with the same type of purported solutions (prioritizing certain users or devices over others). (*Id.*, 1, 4-5 (describing TDMA systems for wireless communications), 12-13 (describing allocating time slots based on user subscription-based levels and premium services); INTEL-1001, 4:25-30 (discussing time slot assignments), 15:52-16:42 (describing classes of users/devices), claim 1 (describing assigning time slots and classes associated with users or devices).)

³ It would have been well within a POSITA's skill to implement an allocation algorithm based on several criteria, such as applying Ward's prioritization to order CTAs associated with the same PM mode or QoS level. (*See* INTEL-1005, 258 (recognizing differing levels of complexity possible in proprietary allocation algorithms).)

239. First, combining the teachings of Ward with Gilb and 802.15.3 allows for increased revenues by offering faster or more service to specific users or tiers of users in exchange for higher fees. As discussed above and in §IV.B.1.e, aside from prioritizing time slots for SPS mode devices and suggesting prioritization schemes based on type of data (QoS), Gilb/802.15.3 otherwise leaves the selection of an appropriate time slot assignment algorithm up to the piconet implementer. Allocating time slots based on PM mode or type of data does not allow a piconet provider to charge different fees to users who want more or less service. Ward, however, allows the piconet implementer to charge more or less depending on the user's service selection. Specifically, Ward discloses that users can receive service "based on the level of subscription paid" and/or for premium services. (INTEL-1007, 12-13.) This allows the provider of the Gilb/802.15.3 system to charge more to users who want more time slots and/or immediate service. (*Id.*) Conversely, users who do not want more time slots or immediate service can pay less. (*Id.* (discussing how higher-level/premium service subscribers pay higher/additional fees).) A POSITA would thus recognize that using Ward's teachings would have allowed more revenue generating opportunities by basing time slot allocations on specific users or user tiers depending on their service selection(s).

240. Second, the references themselves provide a motivation to combine. Gilb specifically refers to the use of IEEE 802.15.3 networks for revenue

generation, such as for a photo kiosk, set-top box video distribution, and other applications. (INTEL-1005, 14, 18-24, 156.) And Ward expressly states that its subscription levels and/or premium options allow greater revenue generation, for example in applications relating to stock price updates. (INTEL-1007, 12-13.) Moreover, as discussed above, the combination of Gilb and 802.15.3 expresses the need for other application-dependent time slot allocation techniques, and Ward discloses a suitable technique for systems like stock price update services that “may be employed in any time division multiplex system.” (INTEL-1005, 93, 258; INTEL-1006, 173; INTEL-1007, 11.)

241. Third, Gilb suggests motivation to use an additional allocation/scheduling algorithm when the PNC has allocated all time slots (i.e., an overflow scenario). In that case, Gilb explains that the PNC stores pending requests without allocating time slots, and then allocates time slots from that list of pending requests when time slots become available. (INTEL-1005, 36, 89, 91-92; INTEL-1006, 189.) In these circumstances, a POSITA would have been motivated to use Ward’s teaching to prioritize messages for certain subscription levels or premium service users over others as a way to determine which messages should be transmitted first.

242. Fourth, the combination of Gilb, 802.15.3, and Ward applies a known technique (Ward’s user-based prioritization) to improve similar systems (the Gilb

and 802.15.3 piconet, which is similar to Ward's TDMA system) in the same way (by supplying an additional criteria for assigning time slots). The known work of Ward's user-based prioritization in a TDMA system would prompt a POSITA to apply its teachings to Gilb and 802.15.3's piconet, because of market forces, through providing the benefit of additional revenue generation from providing services to "premium" subscribers. The Gilb and 802.15.3 combination also is ready for improvement because Gilb/802.15.3 explicitly states that the system can be improved with an assignment algorithm tailored to the particular application of the standard. And the combination of Gilb/802.15.3 with Ward yields predictable results (allocating time slots in a prioritized manner, based on whether a user has subscribed to premium or non-premium services).

243. A POSITA would have also had a reasonable expectation of success combining the teachings of Ward with Gilb and 802.15.3, and the results of the combination would have been predictable. A POSITA would have recognized that Ward's allocation algorithm would have been compatible with the data structures of IEEE 802.15.3. For example, Ward's prioritized time slots could have been assigned using the existing CTA block fields of Gilb/802.15.3, including the appropriate source and destination identifiers. Moreover, a PNC could be provided with Ward's user information (e.g., subscription level) through initial setup

procedures or by using existing techniques in Gilb and 802.15.3.⁴ For example, the Gilb/802.15.3 combination discloses a process for a DEV to inform a PNC of what type of capabilities they have when they join the network, including a field that is reserved for the piconet implementer to provide additional relevant information not already specified in the standard. (INTEL-1005, 74-75; INTEL-1006, 122, Figures 39, 49.) A POSITA would have therefore known to include information such as a DEV's subscription level and/or premium service subscription status in that reserved field.

244. More specifically, Gilb and 802.15.3 each discloses a capabilities field that a DEV sends to the PNC when connecting to the network (i.e., during an “association request”) that provides details related to the DEV capabilities, as the name suggests. (INTEL-1005, 74-75; INTEL-1006, 122.) The association request command contains an identifier of the DEV seeking to join the network (i.e., “the DEV address of the new DEV”) as well information about its capabilities (“Overall Capabilities field” which “shall be formatted” so as to provide information on the

⁴ I note that neither the '129 Patent nor Ward disclose how the relevant coordinator node learns of information relevant to prioritization of devices, confirming that determining how to provide such information would have been well within the level of ordinary skill.

DEV and PNC capabilities”). (INTEL-1005, 74-75; INTEL-1006, 122, Figures 39, 49 (below).)

octets: 1	2	7	8	2	2
DEV utility	ATP	Overall capabilities	DEV address	Length (=18)	Command type

Figure 49—Association request command format

3	4
DEV capabilities	PNC capabilities

Figure 39—Overall capabilities field format

245. The DEV capabilities field includes a “reserved” field which can be used to inform the PNC of the user’s subscription class and/or premium service subscription status. (INTEL-1006, 123.)

bits:b23–b11	b10	b9	b8	b7–b5	b4–b0
Reserved	Listen to Multicast	Listen to Source	Always AWAKE	Preferred fragment size	Supported data rates

Figure 42—DEV capabilities field format

246. A POSITA would have also expected success because Gilb provides example applications for the 802.15.3 piconet that are similar to Ward’s stock price update service. Ward’s stock price update involves transmitting data (stock prices) received from an external source to devices within the communication system—i.e., a content delivery system. Gilb discloses the same types of applications. For example, Gilb expressly discloses similar content delivery systems, including set top boxes and game console/routers that distribute content throughout a home.

(INTEL-1005, 18-22.) This confirms that a POSITA would know how to apply the teachings of Ward to Gilb and 802.15.3 to implement IEEE 802.15.3 in a content delivery system, including Ward's time slot prioritization scheme.

247. In particular, Gilb teaches that an 802.15.3 piconet can support "video distribution from set top boxes to televisions." (*Id.*, 20-22.) In a "set-top box application", the "satellite and cable television are normally delivered to a single box in a house." (*Id.*, 20.) The content would then delivered from that box to other boxes throughout the house over an 802.15.3 connection. Similarly, Gilb discloses that a videogame console can receive data from the internet and act like a wireless router to distribute content to other devices throughout the house. (*Id.*, 18-19.) A POSITA would therefore understand that the DEV acting as the set-top box, router, or video game console acts as the center of the piconet to receive a multimedia stream from an external network, much like the scheduling node distributes stock price information to the devices of individual subscribers. (*Id.*, 18-22, 25 ("PNC is the center of the piconet."); INTEL-1007, 12-13.)

248. To implement the teachings of Ward with the combination of Gilb/802.15.3, a POSITA would have known the PNC would need to refer to data used to implement prioritized time slot assignments. For example, a PNC would refer to data such as a rule or criteria that would be used to determine which users would be prioritized over others (e.g., a rule determining that a higher subscription

level should receive more time slots than a lower one, and/or that premium service investors should receive stock crash updates in the next available time slot).

Likewise, a POSITA would have known that the PNC would refer to data associating each user/DEV with their associated subscription level (e.g., higher or lower) and/or whether each user/DEV is subscribed to the premium service, such as a list that associates DEVs in the piconet with user subscription level and/or premium subscription status.

249. These changes would have been well within the level of ordinary skill in the art,⁵ and would not impose a significant burden on the PNC, and the costs of any such changes would be offset by the opportunity for revenue generation. In particular, Ward's time slot allocation technique is consistent with Gilb's teaching that such technique should not unnecessarily burden the PNC. (INTEL-1005, 26.) Rather than requiring DEVs to constantly send "required data rates, buffer sizes, latencies, and priority to the PNC" to the PNC, and requiring the PNC to sort this information out when allocating time slots (*id.*), Ward's technique provides one simple, static rule that depends on simple user criteria (e.g., a service level and/or

⁵ Neither the '129 Patent nor Ward describes what data the relevant coordinator node uses to implement prioritization, confirming that incorporating such data would have been well within the level of ordinary skill.

premium subscription status) that would have been easy to apply in a PNC. (*See also id.*, 44-45 (“A simple PNC can be built that only uses a very rudimentary channel allocation algorithm” which is useful for cost sensitive applications that “require the ability to run a simple piconet for data transfer”).) Any additional complexity added to the PNC would have been offset by the revenue generation opportunities offered by Ward’s technique. (INTEL-1007, 12-13.)

B. Independent Claims

1. “Class” Limitations

250. Under the correct construction of “*class associated with [user/device]*” limitations—“plain and ordinary meaning in which the class is associated with the client device or user of the client device, **not data items or network characteristics**”—the Gilb-802.15.3-Ward combination renders obvious limitations [1A.2], [1B.2], [1C], [1D], [16D]-[16E], and [18D]-[18E]. The specific claim language at issue in these limitations is below:

- “*the first specific time slot set according to a first class*” [1A.2]
- “*the second specific time slot set according to a second class*” [1B.2]
- “*the first and second specific time slots are determined based on ... priority level data associated with the first class and with the second class*” [1C]
- “*the first class is associated with one or more of the first client device and a user of the first client device, and the second class is associated with one or more of the second client device and a user of the second client device*” [1D]

- “the time slot being determined according to a priority level data associated with a class, the class associated with the one or more of the portable client device and the user of the portable client device” [16D]-[16E], [18D]-[18E]

251. The combination of Gilb, 802.15.3, and Ward applies Ward’s teaching of assigning time slots based on user subscription level and/or premium service subscription in a time slot allocation algorithm of the Gilb-802.15.3 PNC. (INTEL-1007, 12-13.) This combination meets the above limitations for four reasons.

252. First, Ward’s subscription levels and/or premium service subscriptions constitute the “class” or “first class” and “second class.” (*Id.*) For example, a “first class” is a higher subscription level and/or premium service subscription, and a “second class” is a lower subscription level and/or non-premium service subscription.

253. Second, Ward teaches that these classes are “associated with” the “user[s] of [] client device[s]”—namely, the individual users paying for the particular subscription level class and/or premium service class who receive stock price updates on their devices. For example, investors (i.e., “users”) that pay for one subscription level with more frequent time slots would be associated with a “first class,” and other users who pay for a lower level of subscription with less frequent time slots assignments would be associated with a “second class.” (INTEL-1007, 12.) Likewise, investors who pay for the premium service that includes alerts about stock price drops would be associated with a “first class,” and

investors who do not pay for the premium service would be associated with a “*second class*.” (*Id.*, 12-13.) None of these classes is associated with data items or network characteristics; rather they are associated with the investors (“*users*”) that paid for the services.

254. Third, Ward teaches that “*specific*” time slots are “*set according to*” the classes. For example, Ward discloses that users in the higher priority level (“*first class*”) receive more time slots than users in the lower priority level. (INTEL-1007, 12 (“Day traders can pay a ***higher subscription*** so as to be informed more often of their current share prices and a scheduling process ***allocates time slots on the radio channel to investors based on the level of subscription*** paid by such investors . . .”).) That is, the respective “*specific time slots*” that users in each class are assigned to are “*set according to*” an algorithm that depends on the users’ higher subscription or lower subscription levels (i.e., “*class*”). Likewise, “the next available time slot” (“*first specific time slot*”) received by a user when a stock price alert is issued is “*set according to*” the “*class*” of a subscriber to the premium service, whereas a non-premium user that receives a price update at a later time (“*second specific time slot*”) has their time slot “*set according to*” their “*class*” because they received their alert at a later time as a non-premium user. (*Id.*, 12-13.)

255. Finally, Ward’s classes are associated with “*priority level data*” upon which the time slots are determined. Specifically, Ward teaches that higher

subscription level users receive more time slots, and subscribers who pay for a premium service receive stock-crash alerts in the next available time slot. (INTEL-1007-Ward, 12-13.) As discussed above, in the combination, Gilb/802.15.3's PNC would receive and store rules/algorithms to implement Ward's prioritization technique. In the combination, the "*priority level data*" would include this information, such as a rule that equates higher subscription level and/or premium service investors with a higher priority for time slot allocation, the listing that associates DEVs in the piconet with their user's class, and/or the data included in the reserved field of the message sent from the DEV to the PNC during association discussed above in §VI.A.2.

256. Thus, the combination discloses that the "*time slot*" is "*set*" "*according to a [] class*" and "*determined based on ... priority level data associated with the [] class*" [1A.2]/[1B.2]/[1C], [16D], [18C].

* * *

257. Therefore, the combination of Gilb, 802.15.3, and Ward discloses all limitations of claims 1, 16, and 18.

C. Dependent Claims

258. For the above reasons and the reasons discussed in §IV.C.1, 4, the Gilb-802.15.3-Ward combination renders obvious dependent claims 2 and 7. As discussed above in §VI.B.1, the "*first class*" of the Gilb-802.15.3-Ward

combination comprises “*a user associated with the first client device*” and therefore the combination also renders claim 5 obvious.

259. In both examples of network traffic load dependency discussed for claim 6 (*supra* §IV.C.3), in the combination of Gilb, 802.15.3, and Ward, the PNC assigns the time slot(s) based also on subscription/premium service options, rendering claim 6 obvious.

260. Regarding claim 7, when a client DEV in the system of Gilb-802.15.3-Ward becomes unavailable, as discussed in §IV.C.4 (e.g., by disassociation), its CTA becomes available for reassignment. A POSITA would understand that a premium device entering the network (“*third client device*”) would be assigned to the open time slot because the duration of the asynchronous CTA transmitting stock data would be the same. Thus, the combination of Gilb, 802.15.3, and Ward renders claim 7 obvious.

VII. GROUND 4: Claims 1-2, 5-7, 16, and 18 Are Obvious Based On the Combination of Gilb, 802.15.3, Ward, and Brawn

261. The combination of Gilb, 802.15.3, Ward, and Brawn renders claims 1-2, 5-7, 16 and 18 obvious under Petitioner’s construction of “*synchronization information*” and “*class associated with [device/user]*.”

A. Combination Overview

1. IEEE 802.15.3 – Group Allocations

262. The combination of Gilb and 802.15.3 discloses that a coordinating node (PNC) allocates time slots (CTAs) for source devices in the network (DEVs) to send information to destination devices (DEVs) using a “CTA IE” in the beacon. Each allocation is referred to as a “CTA block,” and includes the source DEV’s network identifier (“SrcID”), information about the timing/length of the time slot, and the destination DEV’s network identifier (“DestID”).

263. The combination of Gilb and 802.15.3 discloses that when a source DEV needs to send data to multiple other destination DEVs at the same time, it can request a **group allocation** from the PNC. (INTEL-1005, 88-89; INTEL-1006, 188-90.) For group allocations, the PNC provides multiple CTA blocks in the same beacon. Each of the CTA blocks contains the same source information (“SrcID”) and the same timing information, but has a different destination information (“DestIDs”). (INTEL-1005, 89 (“[T]he PNC creates this allocation by placing CTA blocks in the beacon that have the same SrcID, stream index (= asynchronous stream index), start time, and duration, but different DestIDs.”); INTEL-1006, 189 (“In the case of a group asynchronous allocation, the PNC shall place multiple CTA blocks in the beacon, one for each of the destinations.”).) Because each device receives the full beacon and must scan **all** CTA blocks to determine if they

have received a time slot to send or receive data, a group allocation with 10 devices would require each device to receive a beacon with 10 additional CTA blocks.

264. IEEE 802.15.3 measures the amount of space in the beacon required for each of the fields of the CTA blocks using “octets”—or groups of eight bits:

octets: 2	2	1	1	1
CTA duration	CTA location	Stream index	SrcID	DestID

Figure 26—Channel time allocation block

802.15.3 Figure 26

265. With group allocations, each device receives multiple CTA blocks with the same source (1 octet), CTA duration (2 octets), and CTA location (2 octets). Each device therefore has to read all of that repetitive information from the beacon until it reaches a CTA block that lists its identifier in the destination field.

266. For example, for a group allocation of one time slot (CTA) located 1000 μ s from start of beacon for a duration of 2000 μ s to be sent from a source DEV (e.g., DEV = 1) to ten destination DEVs (e.g., DEVs = 2 to 11), the following 10 CTA blocks must be included in the CTA IE of the beacon:

duration (2 octets)	location (2 octets)	index (1 octet)	src (1 octet)	dest (1 octet)
2000	1000	0	1	2
2000	1000	0	1	3
2000	1000	0	1	4
2000	1000	0	1	5
2000	1000	0	1	6
2000	1000	0	1	7
2000	1000	0	1	8
2000	1000	0	1	9
2000	1000	0	1	10
2000	1000	0	1	11

Table A (Exemplary CTA Blocks)

(*See, e.g.*, INTEL-1006, 117, Figure 26.) Because each CTA block is 7 octets, this group allocation requires 70 octets in the CTA IE.

2. Brawn

267. U.S. Patent Publication No. 2007/0016637A1 to Brawn et al.

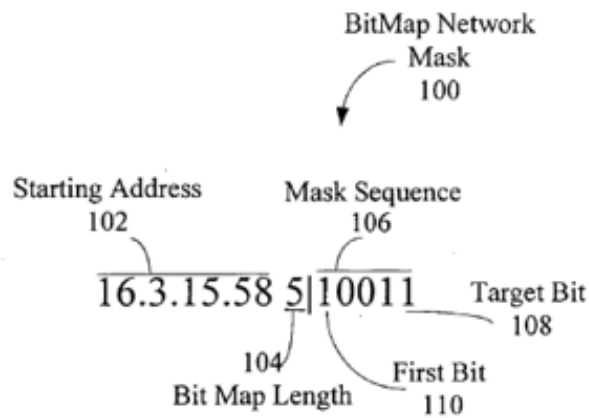
(“Brawn” INTEL-1009), was filed on July 18, 2005 and published on January 18, 2007.

268. Brawn discloses a technique that can reduce the information that the PNC sends when making group allocations, also known as multicast. Brawn is directed to techniques for encoding information in networked systems, including wireless networks. (INTEL-1009, ¶¶2-3, 55.) Brawn discloses a masking scheme that “efficiently describe[s]” multiple “network parameters,” such as a devices’ “network address[es],” using fewer characters. (*Id.*, ¶¶3, 27.) Because network

addresses (or identifiers/IDs) can be long, transmitting/storing many of these IDs can take significant space (i.e., bits). Brawn's technique capitalizes on the fact that IDs often occupy a limited range of numbers—e.g., the numbers 16.3.15.58 through 16.3.15.62. (*Id.*, ¶28.) Rather than include each ID in full when multiple addresses are required, Brawn discloses including only the first ID in full (e.g., 16.3.15.58)—referred to as “starting address 102”—and using shorter numbers (i.e., single bits) to represent other addresses. (*Id.*)

269. Brawn does this using a mask sequence. The mask sequence indicates which addresses after the initial addresses can be turned off and which address must be included—but using fewer numbers. (*Id.*) Brawn first indicates the number of addresses in the mask sequence. (*Id.*) It does this using a field called a “bit map length.” (*Id.*) For example, if the bit map length is 3, the sequence includes the initial address and two subsequent addresses. Next, the mask sequence consists of a series of 1s and 0s. 0s indicate that the address should be masked and 1s indicate that the address should be unmasked. (*Id.*)

270. An example is shown in Figure 1A, reproduced below:



Brawn, Figure 1A

271. The “bitmap length 104” in this example is “5,” indicating that there are five (5) total network addresses: the initial address of 16.3.15.58 and then four that follow: 16.3.15.59, 16.3.15.60, 16.3.15.61, and 16.3.15.62 (INTEL-1009, ¶28.) The mask sequence 106 is then shown: 10011. This is the series of 1s and 0s that masks or unmasks the 5 addresses. The first “1” turns on (unmasks) the first address: 16.3.15.58. The next two “0s” to turn off (mask) 16.3.15.59 and 16.3.15.60 and the final “1s” turn on (unmask) 16.3.15.61 and 16.3.15.62. (*Id.*) Thus, in this example, addresses 16.3.15.58, 16.3.15.61, and 16.3.15.62 are unmasked so that they are identified with fewer bits and without listing all addresses in their entirety.

3. Motivation to Combine

272. As discussed above, Gilb-802.15.3 discloses techniques for assigning group time slot allocations that include multiple destination devices, and Brawn discloses techniques for identifying multiple devices using fewer bits using masks.

A POSITA would have been motivated to use Brawn's bit masking scheme for identifying multiple devices with Gilb-802.15.3's group allocations to provide a stock price update taught by Ward to multiple users that have the same priority level/premium subscription who hold the same stock. As explained below, a POSITA would have been motivated to do so to reduce the amount of information it takes to make a group allocation in Gilb-802.15.3 and to provide stock price updates in fewer time slots.

273. Brawn—like Gilb/802.15.3/Ward—is in the same field as the challenged claims (network, encompassing wireless, communications) and relates to solving the same purported problems addressed in the challenged claims (how to structure communications between network devices) with the same type of purported solutions (using masks to identify specific network devices). (INTEL-1009, ¶¶27 (discussing use of disclosed network addresses in a “network communication protocol”), 28 (disclosing identifying multiple network devices using a mask), 51 (discussing applicability to wireless networks); INTEL-1001, Abstract (describing determining time slot assignments using bit masks in synchronization information), 15:40-43 (“The mask may be used over the superframe and timeslot counts and service provider's PDK ID to determine the superframe and timeslot the PDK is active on in the framing structure”).) A POSITA would be motivated to make this combination for a number of reasons.

274. First, a POSITA would have been motivated to use the group allocations of Gilb and 802.15.3 with Ward to send a stock update in a single time slot to multiple users in the same service level and/or with the same premium subscription status that have the same stock. This would have used fewer time slots—thereby allowing other lower priority users to receive their information sooner—and saved network resources. In the combination of Gilb, 802.15.3 and Ward, shown below, the same stock update (blue arrow) would be provided from the PNC to all users with the same subscription level and/or premium service subscription in the same time slot (yellow):

Trading Floor

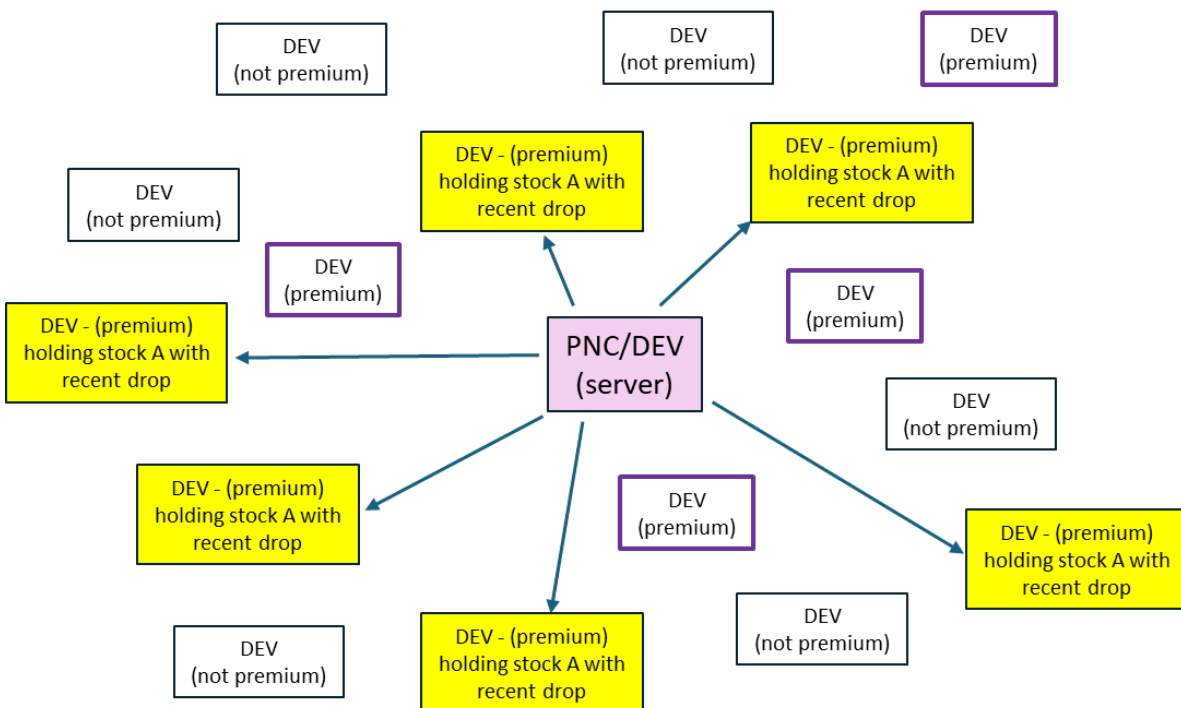


Figure D

275. More specifically, Ward describes an application “which delivers share price information from a base station to pagers owned by subscribers over an asynchronous time division multiplex radio channel.” (INTEL-1007, 12.) In this system, “[e]ach pager has a unique address.” (*Id.*) Ward further describes that “[d]ay traders can pay a higher subscription so as to be informed more often of their current share prices and a scheduling process allocates time slots on the radio channel to investors based on the level of subscription paid by such investors.” (*Id.*) For example, in Ward, premium day traders subscribe to updates of specific stock prices (e.g., Company A, Company B, and Company C). Ward’s application then forms a group of day traders receiving updates for Company A, a group of day traders receiving updates for Company B, etc. The data serving device (e.g., the PNC) requests a first CTA for transmission of Company A share prices to the first group of premium subscribers, a second CTA for transmission of Company B share prices to the second group of premium subscribers, etc. The figure above illustrates this example of Ward’s application in an IEEE 802.15.3 piconet having 20 devices: 1 PNC, 10 premium devices/users receiving Company A stock prices, 8 devices receiving Company B stock prices, and 4 non-premium devices. Note that several of the devices receive both data streams. The blue lines indicate transmission of stock prices during the allocated CTA.

276. A POSITA would have had a reasonable expectation of success combining Gilb-802.15.3's group allocations with Ward, as it would have involved using Gilb-802.15.3's group allocations for the exact disclosed purpose—providing the same information from one source to multiple destinations. (INTEL-1005, 88-89; INTEL-1006, 188-90.)

277. Second, a POSITA would have been motivated to use Brawn's bit masking teachings to assign a group allocation in the combination of Gilb, 802.15.3, and Ward to save space in the beacon. The Gilb-802.15.3 and Ward combination provides for group transmissions in which a single time slot is used to transmit a stock price to multiple devices of the same class, but does so using a beacon that repeats the source ID and timing information in each CTA block for each destination device. (INTEL-1005, 88-89; INTEL-1006, 188-90.) Gilb, however, states that it can be beneficial to reduce the number of bits sent in the beacon, asserting that "[a]s the number of octets in the beacon increases, the probability that it will be correctly received decreases." (INTEL-1005, 52-53.) A POSITA would therefore have recognized that using Brawn's masking with the combination of Gilb-802.15.3 and Ward would reduce the number of unnecessary bits. Specifically, a POSITA would have been motivated to use Brawn's bit masking scheme in the CTA block of Gilb-802.15.3's beacon to assign a CTA for the PNC (source) to communicate with multiple destination DEVs.

278. A POSITA would have readily understood that using Brawn's masking technique, instead of repeating the same ID and timing information in the beacon, would save space. Without Brawn's teachings, a group allocation would require sending and receiving a CTA block with 16 bits (2 octets) for the timing information, 24 bits (3 octets) for additional information (CTA location and Streaming index), and 16 bits (2 octets) to identify the source and destination IDs for a total of 7 octets and 56 bits **for each** destination device. (INTEL-1006, FIG. 26.) In contrast, Brawn's masking technique would only require 8 bits (1 octet) to indicate the map length and as little as one bit per additional destination device.

279. A POSITA would have accomplished this by simply modifying the last field in the Gilb-802.15.3 CTA block to include Brawn's masks while leaving the rest unchanged. The fields of Gilb-802.15.3's CTA block are illustrated in Figure 26 of 802.15.3, along with information regarding the size of each field (in octets). Using Brawn's masking scheme as discussed above, a POSITA would have been motivated to replace the **destination ID** of the CTA block field (outlined in **blue** in original Figure 26 of 802.15.3) with Brawn's **starting ID, length** and **mask sequence** as illustrated in **red** in the modified Figure 26 below. In this combination, instead of sending each device multiple CTA block with same CTA duration, location, stream index, and SrcID, **only one single modified CTA block** would be sent for the entire group to allocate a timeslot to *all* destination devices:

Without Brawn: Separate CTA Block Sent for Each Destination Device

octets: 2	2	1	1	1
CTA duration	CTA location	Stream index	SrcID	DestID

Figure 26—Channel time allocation block

Ex-1006-802.15.3, Figure 26

With Brawn: Single CTA Block For Entire Group

octets: 2	2	1	1	1 octet	1 octet	1-32 octets
CTA duration	CTA location	Stream index	SrcID	starting address	length	map

Figure 26—Channel time allocation block

Ex-1006-802.15.3, Figure 26 (Modified to include Teachings of Brawn

280. Because Brawn’s mask sequence can use as little as one bit for each additional address (or ID) receiving the assignment (INTEL-1009, ¶28), this scheme would reduce the size of Gilb-802.15.3’s beacon for group allocations.⁶ For example, if the piconet has 32 devices, the length field in the modified Figure 26 above will have a value of “32” (which can be represented with 8 bits, or 1 octet) and the mask sequence will be 32 bits long (which can be represented with 4

⁶ An IEEE 802.15.3 piconet can have up to 256 devices. (INTEL-1005, 161-62 (“The command type is two octets, and the standard has only used or reserved for use the first 256 . . . If the standard ever did run out of element IDs or command types”) Because Brawn’s mask can be up to the length of the entire list of devices, the mask can be up to 32 octets long.

octets). Whereas a group allocation of 10 of 32 potential destination devices would require 70 octets (7 octets per each of the 10 destination devices) to identify the source and destination 10 times using Gilb/802.15.3's separate allocations, Brawn's technique would require only 6 octets—one for the starting ID, one to represent the length, and 32 bits (4 octets) for the mask sequence (one bit per device in the piconet).

281. A POSITA would have had a reasonable expectation of success combining the bit masking teachings of Brawn with the combination of Gilb, 802.15.3, and Ward, and the results of the combination would have been predictable, at least because the combination would have merely involved replacing the known destination device identification technique in Gilb, 802.15.3, and Ward with a known bit masking technique disclosed by Brawn. Brawn itself suggests that the disclosed technique “can be applied to many common network functions.” (INTEL-1009, ¶3). Further, a similar mask-based technique was already proposed for 802.15.3 for specifying multiple device IDs to be included a “multicast group”—a set of devices that can be assigned time slots to receive information simultaneously using the multicast group's “Group ID,” demonstrating that POSITAs would have been motivated to use a mask technique with Gilb/802.15.3's resource allocation scheme to use fewer bits to signal group allocations. (See INTEL-1019, 4.)

282. Specifically, in a submission to the IEEE in 2004, the author of Gilb proposed updating the information element broadcast in a beacon to announce a multicast group to include a masking technique similar to Brawn's. In the submission, the author of Gilb proposed using the following representation technique having a similar layout as Brawn to identify all device IDs to be included in the multicast group:

octets: 1-32	1	1	8	1	1
Group IDs	Start DEVID	McstGrpID	Multicast address	Length (=11 to 42)	Element ID

Figure 1—Multicast Group information element format

(INTEL-1019, 4, Figure 1.) In the above Figure 1 the proposal teaches to assign a multicast group a multicast group ID (“McstGrpID”) that identifies the group in the piconet. (*Id.*) The devices included in the multicast group are identifies using a masking technique. (*Id.*) Like in Brawn, the proposal teaches to identify a first device ID (“Start DEVID”). (*Id.*; INTEL-1009, ¶28, FIG. 1A.) Like Brawn, the proposal teaches that any other devices in the group can be identified with a mask called “Group IDs” in which “[e]ach bit ... when set to one indicates the DEV whose DEVID is equal to the start DEVID plus the bit position in the Group ID bitmap is a member of the multicast group identified by the Multicast Address and McstGrpID fields.” (INTEL-1019, 4, FIG. 1; INTEL-1009, ¶28, Figure 1A.) Finally, like Brawn, the proposal teaches to signal the length of the mask with a “Length” field. (INTEL-1019, 4, FIG. 1; Brawn, ¶28, Figure 1A.) Corresponding

elements of Brawn's and the proposal's bit masks are shown in the annotated Figure 1A of Brawn and Figure 1 of the proposal, below:

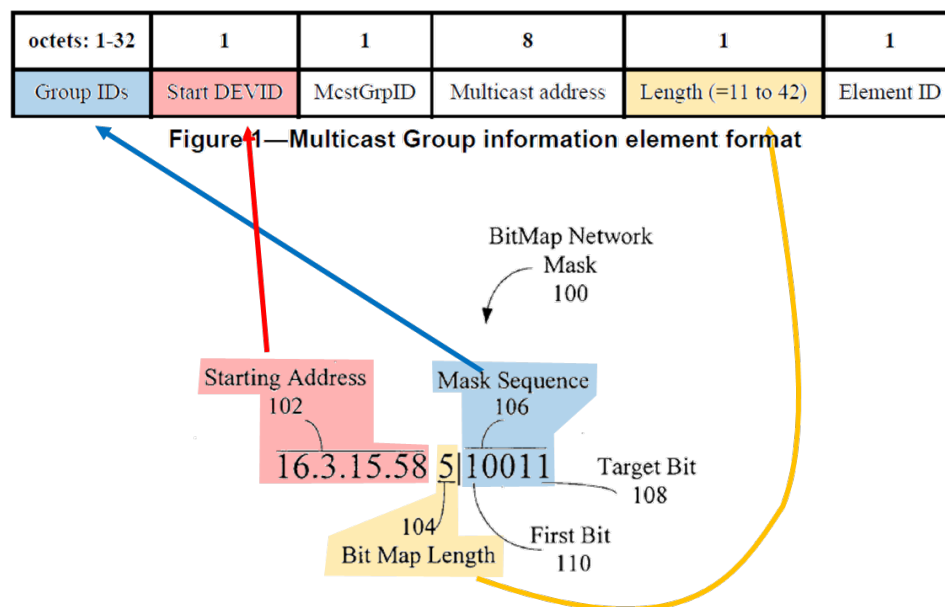


FIG. 1A

Brawn, Annotated Figure 1A

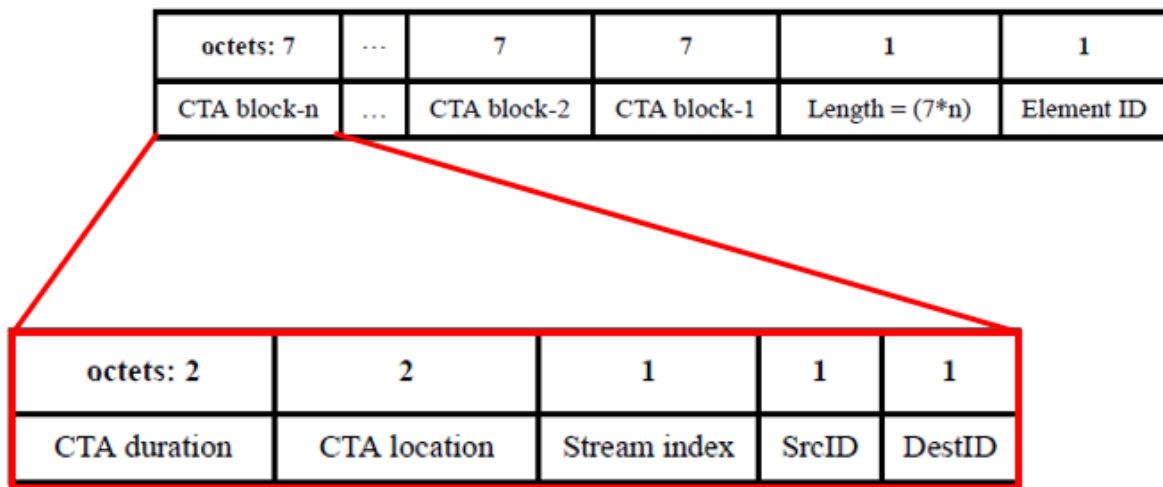
(INTEL-1019, Figure 1; Brawn, Figure 1A.) Whereas the proposal requires setting up a multicast group ID before allocating time slots for delivering a message to multiple devices, the proposed combination of Gilb, 802.15.3, Ward, and Brawn would permit such group allocations on-the-fly, while still reducing the number of bits required to assign a time slot to a group of devices in the beacon.

283. A POSITA would have therefore expected success in applying Brawn's scheme for identifying a group of users to applications involving using a

mask for the transmission of data to multiple high priority subscribers in the same time slot in the combination of Gilb, 802.15.3 with Ward.

284. The combination of Brawn with Gilb, 802.15.3, and Ward therefore constitutes the use of a known technique (i.e., Brawn's bit masking technique) with similar devices (i.e., Gilb/802.15.3 and Ward's wireless network devices, similar to the devices in Brawn, which can be used for wireless access (*see* INTEL-1009, Figure 10, ¶51)) in the same way (i.e., by representing a range of destination IDs associated with devices using fewer bits).

285. I note that Brawn's fields are unnecessary for an allocation of a CTA to a single destination device. A POSITA would have therefore been further motivated to include an indicator to differentiate the CTA block as an individual or group application. This information could have been integrated, e.g., into an existing field in the CTA block, such as the stream index field, without increasing the size of individual allocations. (*See* INTEL-1006, 117, Figure 26 (bottom). The stream index field indicates the stream corresponding to the channel time allocation. (INTEL-1006, 117.) It is one octet in length, supporting values from 0 to 255. A POSITA would have understood that the most or least significant bit could be used to designate group versus individual allocation, leaving 7 bits (128 values) to indicate the stream. A POSITA would have understood 128 values was sufficient for the number of streams in an IEEE 802.15.3 piconet.



B. Independent Claims

1. “Synchronization Information” Limitations – [1C], [16A-C], [18A]-[18B]

286. As discussed above in §§IV.B.1.b-d, IV.B.2.b-c, IV.B.3.d, VI.B, the combination of Gilb, 802.15.3, and Ward renders obvious “*synchronization information*” in limitations 1[C], [16A]-[16C], and [18A]-[18B] under PO’s interpretation of the claims. Under the correct construction of “*synchronization information*,” which requires “*information that contains individual bit masks to be applied to bit fields of individual client devices*,” these limitations are obvious over Gilb, 802.15.3, and Ward in further view of Brawn.

287. First, Brawn in combination with Gilb/802.15.3 and Ward discloses synchronization information: bit masks that are applied to bit fields of individual client devices. As explained in §VII.A, the combination of Gilb, 802.15.3 and Ward with Brawn uses a “*mask*” (i.e. mask sequence) that reduces the amount of

information needed for group allocations in Gilb/802.15.3 and Ward. The mask sequence of Brawn is made up of individual masks that are one bit in length (i.e., bit masks). (INTEL-1009, ¶¶27-29.) When Brawn's masks are used with the combination of Gilb/802.15.3 and Ward for a group allocation to all devices of the same priority receiving the same stock price information, Brawn's mask is transmitted in Gilb/802.15.3's beacon to each device, and each individual device looks through that information to identify whether its individual bit field is masked or unmasked. That is, each individual device applies the mask to its own individual bitfield in the mask sequence and, if that bitfield is equal to "1," determines the CTA is intended for it.

288. In particular, the field in Gilb/802.15.3 (i.e., DestID) identifying which devices (DEVs) will receive stock information from the PNC in a particular time slot would be indicated with Brawn's mask technique. The first receiving device (e.g., the one with the lowest ID) would be identified with the starting ID field in the modified Figure 26 above, and the mask in the last field would indicate which other devices are also to receive the transmission in the assigned time slot (CTA) using zeros and ones. That is, each of the other devices would determine how far away from the starting ID their own ID is, and then check the associated bit field in the mask to see if their ID has been masked or unmasked with their individual mask. For bits in which the individual mask in the mask sequence has a

value of “1,” the mask applies to bit fields of those devices that they are thereby assigned to the time slot. (INTEL-1009, ¶¶28-29.) For bits in which the individual mask in the mask sequence has a value of “0,” the mask applies to the bit fields of those devices such that they are not assigned to the time slot. (*Id.*) For example, if the starting ID is “0” and an individual client device’s ID is “4”, the 4th bit in the mask sequence is the individual mask that is applied to the bit field of the individual client device (i.e., to the location in the mask that is associated with the client device’s network ID).

289. Second, in the combination, time slots are determined based on this synchronization information. As discussed in §IV.B.1.d, Gilb/802.15.3’s CTA block includes a CTA duration and CTA location which specify a “*specific time slot*” in the IEEE 802.15.3 superframe. As discussed in §VII.A.3, the combination of Gilb, 802.15.3, Ward, and Brawn incorporates Brawn’s mask into the CTA allocation of Gilb/802.15.3 to identify all destination IDs for group allocations (i.e., the mask is used to determine the “*specific time slot*” because the mask is used in the CTA block for the “*specific time slot*” to show which device(s) have are assigned to the time slot, when to listen, for how long, and from where). Thus, in applications in which data is transmitted to a group of destinations such as all users with the same priority level/premium subscription that hold the same stock in Ward (INTEL-1007

12-13), Brawn’s mask specifies that the “*specific time slot*” of Gilb/802.15.3/Ward is assigned to each DEV identified by the mask.

290. Accordingly, for the above reasons and the reasons described in §§IV.B.1.d, IV.B.2.c, IV.B.3.d, the combination of Gilb, 802.15.3, Ward, and Brawn discloses “*synchronization information comprising information assigning a specific time slot during which the client device can receive data from the network device*” [16C] “*the synchronization information comprising information assigning a time slot during which the client device can receive data*” [18B] and “*the first and second specific time slots are determined based on synchronization information wirelessly received by the first and second client device*” [1C] under Petitioner’s construction.

C. Dependent Claims

291. For the same reasons discussed in §§IV.C, and VI.C, the combination of Gilb, 802.15.3, Ward, and Brawn renders obvious dependent claims 2, and 5-7.

VIII. GROUNDS 5-6: The combination of Gilb, 802.15.3, Ward, and Cai and the combination of Gilb, 802.15.3, Ward, Brawn, and Cai each renders claims 12-13 and 15 obvious.

A. Motivation to Combine

292. For the same reasons discussed in §VI.A.2, a POSITA would be motivated to combine Cai’s two-layer MAC with the DEV of Gilb-802.15.3-Ward (Ground 5) and with the DEV of Gilb-802.15.3-Ward-Brawn (Ground 6).

B. Independent Claim 12

293. The preamble [12P] and limitations [12A], [12B], and 12[E] are disclosed by the Gilb-802.15.3-Ward-Cai and Gilb-802.15.3-Ward-Brawn-Cai combinations for the reasons discussed at §§V.B.1-3, 5.

294. As discussed in §V.B.4, Cai discloses the “*client device stor[es] a bit field identifying a specific time slot*” in the status registers of the Tx/Rx scheduler of the LMAC. Thus, for the same reasons discussed in §V.B.4, limitation [12F] is disclosed by the Gilb-802.15.3-Ward-Cai and Gilb-802.15.3-Ward-Brawn-Cai combinations.

C. Dependent Claims

295. For the reasons discussed at §§V.C.1-2, the Gilb-802.15.3-Ward-Cai and Gilb-802.15.3-Ward-Brawn-Cai combinations each renders claims 13 and 15 obvious.

IX. Conclusion

296. In signing this declaration, I recognize that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

297. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Executed this 23rd day of December in Timisoara, Romania.

A handwritten signature in black ink, appearing to read "James Lanford", is written over a light blue rectangular background.

Appendix A

Exhibit	Reference
1001	U.S. Patent 8,219,129 to Brown
1002	File History for U.S. Patent 8,219,129
1004	Curriculum Vitae of Dr. James Lansford
1005	“Wireless Multimedia ... A Guide to the IEEE 802.15.3 Standard” by Gilb (“Gilb”)
1006	Part 15.3: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for High Rate Wireless Personal Area Networks (WPANs) (“IEEE 802.15.3”)
1007	WO 02/067009 to Ward, et al. (“Ward”)
1008	“A Novel Design of IEEE 802.15.3 MAC over UWB” by Cai et al. (“Cai”)
1009	U.S. Patent Publication 2007/0016637A1 to Brawn, et al. (“Brawn”)
1010	Declaration of June Ann Munford
1011	Declaration of David Ringle
1012	Patent Owner’s List of Proposed Claim Constructions from <i>Proxense, LLC v. Intel Corp.</i> , No. 6-24-cv-00283 (WDTX)
1013	Intel’s List of Proposed Claim Constructions from <i>Proxense, LLC v. Intel Corp.</i> , No. 6-24-cv-00283 (WDTX)
1014	U.S. Patent No. 7,209,955 to Major (“Major”)
1015	Patent Owner’s Revised Infringement Contentions for ’129 patent from <i>Proxense, LLC v. Intel Corp.</i> , No. 6-24-cv-00283 (WDTX)
1016	U.S. Patent Publication 2006/0002349 to Demirhan (“Demirhan”)
1017	U.S. Patent Publication 2003/0152059 to Odman (“Odman”)
1018	“A Novel Scheduling Scheme and MAC Enhancements for IEEE 802.15.3 High-Rate WPAN” to Zeng, et al.

Exhibit	Reference
1019	Draft Running Comment Resolution, IEEE P802.15 Wireless Personal Area Networks by James P. K. Gilb, July 2004 (“Multicast Group Submission”)
1020	Wireless Communication Standards, A Study of IEEE 802.11 TM , 802.15 TM , and 802.16 TM , by Todor Cooklev (“Cooklev”)
1021	“Welcome to Standards Information Network,” IEEE (2004) https://web.archive.org/web/20040603154924/http://www.standards.ieee.org/StandardsPress/
1022	“Get IEEE 802,” IEEE (2003), https://web.archive.org/web/20031008112815/http://www.standards.ieee.org/getieee802/
1023	“Get IEEE 802.15 Wireless Lans,” IEEE (2004), https://web.archive.org/web/20040414112100/http://standards.ieee.org/getieee802/802.15.html
1024	“IEEE-SA Template,” IEEE (2005), https://web.archive.org/web/20050529084555/http://standards.ieee.org/getieee802/download/802.15.3-2003.pdf
1025	“Get IEEE 802 Update,” IEEE Standards Association (2018), https://mentor.ieee.org/802-ec/dcn/18/ec-18-0210-00-00SA-ieee-802-november2018-standardsdownloadreport.pdf
1026	U.S. Patent Publication 2004/0025179 to Russ
1027	U.S. Patent Publication 2005/0113102 to Kwon
1028	U.S. Patent Publication 2005/0265371 to Sharma
1029	“Comparison of IEEE 802.11e and IEEE 802.15.3 MAC” by Wang, et al., Proceedings of the IEEE 6 th Circuits and Systems Symposium on Emerging Technologies: Frontiers of Mobile and Wireless Communication (2004)

Exhibit	Reference
1030	“Intra-superframe power management for IEEE 802.15.3 WPAN,” by Guo et al., IEEE Communications Letters, Volume 9, Issue 3 (March 2005)
1031	U.S. Patent Publication 2006/0205408 to Nakagawa (“Nakagawa”)
1032	United States District Courts National Judicial Caseload Profile, September 30, 2024, https://www.uscourts.gov/sites/default/files/2024-12/fcms_na_distprofile0930.2024.pdf
1033	Amendment to Part 15.3: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for High Rate Wireless Personal Area Networks (WPANs), Amendment 1: MAC Sublayer