IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

OLLNOVA TECHNOLOGIES LTD, Plaintiff, v. ECOBEE TECHNOLOGIES ULC d/b/a ECOBEE, Defendant.	Case No. 2:22-cv-00072-JRG JURY TRIAL DEMANDED

EXPERT REPORT OF DR. JOHN MARTENS REGARDING INVALIDITY OF US PATENTS 8,224,282, 7,746,887, 7,860,495, and 8,264,371

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I. INTRODUCTION

1. Exponent, Inc. ("Exponent") has been retained by Venable, LLP ("Venable") on behalf of ecobee Technologies ULC d/b/a ecobee ("ecobee") to provide technical services and independent opinions on certain issues relating to United States Patent No. 8,224,282 ("the '282 Patent"), 7,746,887 ("the '887 Patent"), 7,860,495 ("the '495 Patent"), and 8,264,371 ("the '371 Patent").[1]

2. In particular, I, John Martens, was requested to review the subject matter of the '282 Patent, the '887 Patent, the '495 Patent, and the '371 Patent, along with certain of the claims therein, and opine as to whether the requirements of these claims are disclosed by various prior art references, as well as other issues relating to the validity of the asserted patents as discussed further below. The opinions and comments formulated during this assessment are based on observations and information available at the time of my review. The findings presented herein are made to a reasonable degree of scientific certainty. I have made every effort to accurately and completely investigate all areas of concern identified during my review. I reserve the right to supplement this report if and when new information becomes available after this report is signed, including, but not limited to, additional discovery or documents, opinions of the Court, and the opinions and testimony of other experts in this case. I reserve the right to respond to any opinions offered by other experts and to any testimony offered at trial. And I reserve the right to create graphics or demonstratives to support my opinions if called to testify at a trial.

II. EXPERIENCE

3. I am a salaried employee of Exponent. Exponent charges $650 per hour for my time plus expenses for work performed in connection with this project. I have received no additional

[1] These four patents are referred to collectively herein as "the asserted patents" or "the Patents-in-Suit."

compensation for work in this case, and my compensation does not depend upon the contents of this report, any testimony I may provide, or the ultimate outcome of the case.

4. Exponent is an engineering and science consulting firm headquartered at 149 Commonwealth Drive, Menlo Park, California, 94025. Exponent has been retained by counsel for ecobee in this matter to provide independent technical expert consulting services. I, John Martens, am the investigator for the subject matter in this report.

5. I hold Bachelor of Science (1993), Masters of Science (1993), and Doctor of Philosophy (2000) degrees in electrical engineering and applied physics from Case Western Reserve University ("CWRU") in Cleveland, Ohio, and a Masters of Business Administration (2003) from The University of Michigan in Ann Arbor.

6. I am currently a registered Professional Engineer in the states of Alabama, Illinois, Florida, Kansas, Michigan, Missouri, New York, North Carolina, Ohio, Texas, West Virginia, and the District of Columbia.

7. I am a Certified Explosions and Fire Investigator. Additionally, I am a Principal Member of the Technical Committee on Single Burner Boilers, National Fire Protection Association 85 Boiler and Combustion Systems Hazards Code, and a member of the American Society of Mechanical Engineers CSD-1 Standard, Controls and Safety Devices for Automatically Fired Boilers, both of which relate to computer control of industrial boilers.

8. I was the recipient of the Eta Kappa Nu/IEEE's Award for Outstanding Senior in Electrical Engineering (1993), the Ohio Aerospace Institute Fellowship (June 1993 – May 1994), the Centerior Energy Fellowship (May 1992 – May 1993), the General Motors Scholarship (May 1990 – May 1992), and the Case Alumni Association Scholarship (September 1988 – May 1990).

9. I am a member of Institute of Electronics and Electrical Engineers (Senior Member), American Society of Mechanical Engineers, the Society of Automotive Engineers, and the National Fire Protection Association

A. Career History & Relevant Industry Participation

10. I am a Principal Engineer in Exponent's Electrical Engineering and Computer Science practice and the Director of the Chicago-area offices. I specialize in control systems and software, computer and microprocessor-based systems, circuit design and analysis, electronic components failure analysis, automotive control systems, electronic stability control systems, programmable logic controllers and process control (including Distributed Control Systems and Supervisory Control and Data Acquisition systems analysis), robotics and automation, computer vision, consumer products design and failure analysis, and intellectual property issues.

11. I have over 25 years of experience with systems and controls. My experience encompasses embedded systems, microcontrollers, microprocessors, sensors, actuators, electronics, systems, algorithms, software, firmware, robotics, mechatronics, vision processing, artificial intelligence, and control philosophy.

12. As a facilities manager for the Center for Automation and Intelligent Systems Research CAISR Mechatronics Laboratory at CWRU, I was responsible for developing and maintaining hardware and algorithms for various industrial and research robots. This work included algorithms for vision processing, sonar sensors, coordinated robot control, collision avoidance, robot behavior, and more.

13. As an Advanced Chassis Control Engineer at Delphi, I designed algorithms for real-time damping vehicle suspension control and prototypes of engine mounting control. I also researched and developed algorithms and systems for reduced-sensor vehicle leveling control and was involved in designing and implementing algorithms for collision detection and avoidance systems.

14. While working for Computer Aided Manufacturing of Laminated Engineering Materials, I was responsible for integrating vision processing and robot controls to coordinate assembly of a laminated prototype fabrication system. The work involved sensor selection, interface circuit design, and algorithm development.

15. Further details regarding my background, qualifications, publications, and presentations are included in my curriculum vitae, which is attached as Appendix A to this report. In forming my opinions, I have relied upon my education, knowledge of embedded and control systems for automation, and related experience described above. I have also relied on my understanding of information provided to me by counsel.

III. DESCRIPTION OF ACTIVITIES AND OVERVIEW OF OPINIONS

A. Description of Activities

16. I have been asked to examine the Patents-in-Suit, their associated prosecution histories and proceedings, prior art and relevant materials to assess the validity of certain claims of the Patents-in-Suit. I describe herein my opinions regarding invalidity of the following claims, which I understand to be the claims that are currently at issue in this lawsuit:

1) '282 patent claims 1, 3, 6 and 21[2];
2) '887 patent claims 1, 11, 12, 20 and 21;
3) '495 patent claims 1 and 2; and
4) '371 patent claims 1, 4, 5, 17 and 19.[3]

17. In forming my opinions presented herein, I have studied the Patents-in-Suit and their respective U.S. Patent Office proceedings and references cited therein. I have also reviewed

[2] Claim 21 of the '282 patent is a dependent claim that depends from independent claim 20. Therefore, in my analysis below, I have also analyzed independent claim 20.

[3] These claims are referred to collectively herein as "the asserted claims" or "the Claims-in-Suit."

numerous prior art patents, publications, and other relevant materials, which I will identify and discuss throughout this report.

18. I have further reviewed the Claim Construction Order that I understand was issued by the Court in this lawsuit, and have applied the Court's constructions to my analysis below. Provided below is the Court's summary of its rulings on claim construction, but I understand further context has been provided in the Order, which I have also considered.

Disputed Term	The Court's Construction
"wherein transmission of the most recent reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a change in the sensed condition within the predetermined range" ('887 patent, claim 1)	"wherein the transmission of the most recent reading of the indicator that would otherwise occur is stopped for the remainder of the transmission interval in response to detecting a change in the sensed condition within the predetermined range"
"information associated reading of the indicator" ('887 patent, claims 1, 21)	"information associated with the reading of the indicator"
"receive sensor control information related to sensor data in control at a second automation component in communication with the building automation system" ('282 patent, claim 1)	"receive information that identifies which sensor or sensor value is driving or controlling a second automation component in communication with the building automation system"
"[first/second] automation component" ('282 patent, claims 1, 5, 7, 11, 13, 19, 20)	"[first/second] component designed to operate without human interaction in an automation system"
"identification flag for each identified sensor value" ('282 patent, claim 4)	Claim 4 depends from claim 3 rather than claim 1.
"free of communications with the second wireless network" ('495 patent, claim 1)	Plain and ordinary meaning.

Disputed Term	The Court's Construction
"the second processors having a greater processing power and storage capacity than the first processors" ('495 patent, claim 3)	"each of the second processors having a greater processing power and storage capacity than each of the first processors"
"change-of-value request message" ('371 patent, claims 1, 2, 6)	"a message that requests or directs an automation component to indicate if detected values, received values, parameters, or measurements have changed or altered beyond a predetermined reporting limit"
"change-of-value messages" ('371 patent, claims 1, 8, 10, 13, 17, 19)	"messages indicating if detected values, received values, parameters, or measurements have changed or altered beyond a predetermined reporting limit"

19. I further understand that the parties have agreed to the following claim constructions, and have applied the same in my analysis below:

Claim Term	Agreed Construction
"a multi-sensor package" ('282 patent, claims 1, 7, 13, 20)	"a single packaged sensor device, not a group of individual sensors"
"chance" ('887 patent, claim 1)	"change"

20. Should any new or different claim constructions or interpretations arise in the future, I reserve the right to address those constructions, and any impact they may have on my opinions expressed herein.

21. I have also reviewed the invalidity contentions and amendments thereto, and the subject matter eligibility contentions, asserted by ecobee in this lawsuit, including certain prior art identified therein. I have also reviewed Ollnova's responses to ecobee's interrogatory numbers 13 and 14 concerning invalidity and subject matter eligibility of the claims of the Patents-in-Suit.

22. Throughout this report, I refer to selected portions of the cited documents to support my opinions. These citations are exemplary, and I reserve the right to rely on other portions of the documents to support my opinions as appropriate. In reaching the opinions in this report, I have considered, among other materials, the materials identified in the body of this report and in the attached Appendix B.

23. I currently expect that I may provide testimony at trial which conveys the opinions as set forth in this report. I further expect that I may provide testimony comprising a tutorial or background on technology which is pertinent to my validity analysis, and that such testimony may include exhibits and demonstrations which help illustrate or otherwise support the opinions expressed in this report. I discuss at least some of such demonstrations here. I have not yet prepared all such exhibits or demonstrations but expect to do so in accordance with the Court's scheduling orders.

24. It is my understanding that the trial addressing the validity of the Patents-in-Suit may be conducted prior to or concurrent with plaintiff Ollnova's presentation of its infringement case against ecobee. I have prepared this report prior to receiving or reviewing any expert report Ollnova may serve concerning infringement, or any rebuttal report Ollnova may serve concerning invalidity. I therefore reserve the right to present testimony at trial directed to any or all of Ollnova's and its experts' infringement allegations and opinions as they have been asserted against the accused products, for the purpose of showing the manner in which Ollnova has interpreted the claims in asserting infringement and the impact that may have of invalidity. I further reserve the right to present testimony at trial directed to any or all of Ollnova's and its experts' allegations and opinions concerning my opinions herein, including without limitation any allegations or opinions that differ in any way from those set forth in Ollnova's responses to ecobee's interrogatory

numbers 13 and 14 concerning invalidity and subject matter eligibility of the claims of the Patents-in-Suit.

B. Overview of Opinions

25. As set forth in this report, it is my opinion that all asserted claims of the Patents-in-Suit are invalid for the following reasons:

i. The ’282 patent:

26. It is my opinion that claims 1 and 6 of the Asserted Claims of the ’282 patent are anticipated or rendered obvious to a POSITA by the prior art Ahmed. Thus, I understand that each of claims 1 and 6 of the ’282 patent is invalid (Section VI.C).

27. It is my opinion that claims 1 and 6 of the Asserted Claims of the ’282 patent are anticipated or rendered obvious to a POSITA by the prior art McFarland. Thus, I understand that each of claims 1 and 6 of the ’282 patent is invalid (Section VI.D).

28. It is my opinion that each of the Asserted Claims 1, 3, 6, 20, and 21 of the ’282 patent are rendered obvious by the combination of the prior art Ahmed and Kates that a POSITA would have been motivated to make. Thus, I understand that each of claims 1, 3, 6, 20, and 21 of the ’282 patent is invalid (Section VI.E).

29. It is my opinion that each of the Asserted Claims 1, 3, 6, 20, and 21 of the ’282 patent are rendered obvious by the combination of the prior art McFarland and Kates that a POSITA would have been motivated to make. Thus, I understand that each of claims 1, 3, 6, 20, and 21 of the ’282 patent is invalid (Section VI.F).

30. It is my opinion that each of the Asserted Claims 1, 3, 6, 20, and 21 of the ’282 patent are rendered obvious by the combination of the prior art McFarland and Liu that a POSITA would have been motivated to make. Thus, I understand that each of claims 1, 3, 6, 20, and 21 of the ’282 patent is invalid (Section VI.G).

ii. The ’887 patent:

31. It is my opinion that each of the Asserted Claims 1, 11, 12, 20, and 21 of the ’887 patent is anticipated or rendered obvious to a POSITA by the prior art Kates. Thus, I understand that each of claims 1, 11, 12, 20, and 21 of the ’887 patent is invalid (Section VII.C).

32. It is my opinion that each of the Asserted Claims 1, 11, 12, 20, and 21 of the ’887 patent is anticipated or rendered obvious to a POSITA by the prior art Helgeson. Thus, I understand that each of claims 1, 11, 12, 20, and 21 of the ’887 patent is invalid (Section VII.D).

33. It is my opinion that each of the Asserted Claims 1, 11, 12, 20, and 21 of the ’887 patent is anticipated or rendered obvious to a POSITA by the prior art Lareau. Thus, I understand that each of claims 1, 11, 12, 20, and 21 of the ’887 patent is invalid (Section VII.E).

34. It is my opinion that each of the Asserted Claims 1, 11, 12, 20, and 21 of the ’887 patent is rendered obvious by the combination of the prior art Kates and Lareau that a POSITA would have been motivated to make. Thus, I understand that each of claims 1, 11, 12, 20, and 21 of the ’887 patent is invalid (Section VII.F).

35. It is my opinion that each of the Asserted Claims 1, 11, 12, 20, and 21 of the ’887 patent is rendered obvious by the combination of the prior art Helgeson and Lareau that a POSITA would have been motivated to make. Thus, I understand that each of claims 1, 11, 12, 20, and 21 of the ’887 patent is invalid (Section VII.G).

iii. The ’495 patent:

36. It is my opinion that each of the Asserted Claims 1 and 2 of the ’495 patent is rendered obvious to a POSITA by the prior art Mesarina. Thus, I understand that each of claims 1 and 2 of the ’495 patent is invalid (Section VIII.C).

37. It is my opinion that each of the Asserted Claims 1 and 2 of the ’495 patent is rendered obvious to a POSITA by the prior art Herrmann. Thus, I understand that each of claims 1 and 2 of the ’495 patent is invalid (Section VIII.D).

38. It is my opinion that claim 1 of the Asserted Claims of the ’495 patent is rendered obvious to a POSITA by the prior art Pasternak. Thus, I understand that each of claim 1 of the ’495 patent is invalid (Section VIII.E).

39. It is my opinion that claim 2 of the Asserted Claims of the ’495 patent is rendered obvious by the combination of the prior art Pasternak and Herrmann that a POSITA would have been motivated to make. Thus, I understand that each of claim 1 of the ’495 patent is invalid (Section VIII.F).

40. It is my opinion that claim 1 of the Asserted Claims of the ’495 patent is rendered obvious to a POSITA by the prior art Ahmed. Thus, I understand that each of claim 1 of the ’495 patent is invalid (Section VIII. G).

41. It is my opinion that claim 2 of the Asserted Claims of the ’495 patent is rendered obvious by the combination of the prior art Ahmed and Herrmann that a POSITA would have been motivated to make. Thus, I understand that each of claim 1 of the ’495 patent is invalid (Section VIII.H).

iv. The ’371 patent:

42. It is my opinion that each of the Asserted Claims 1, 4, 5, 17, and 19 of the ’371 patent is anticipated or rendered obvious to a POSITA by the prior art Kates. Thus, I understand that each of claims 1, 4, 5, 17, and 19 of the ’371 patent is invalid (Section IX.C).

43. It is my opinion that each of the Asserted Claims 1, 4, 5, 17, and 19 of the ’371 patent is anticipated or rendered obvious to a POSITA by the prior art Hitt. Thus, I understand that each of claims 1, 4, 5, 17, and 19 of the ’371 patent is invalid (Section IX.D).

44. It is my opinion that claims 1, 4, and 5 of the Asserted Claims of the ’371 patent is anticipated or rendered obvious to a POSITA by the prior art Helgeson. Thus, I understand that each of claims 1, 4, and 5 of the ’371 patent is invalid (Section IX.E).

45. As set forth below, it is my opinion that the asserted claims of the Patents-in-Suit are anticipated and/or rendered obvious by prior art references addressed herein. It is my opinion that the prior art references discussed below are material to the patentability of the asserted claims, such that, had the prior art references addressed herein been before the United States Patent and Trademark Office (“USPTO”) during the prosecution proceedings that resulted in the Patents-in-Suit (including the portions of those prior art references discussed below), the asserted claims would not have been allowed to issue as they appear in the Patents-in-Suit.

46. When applying certain prior art references to the asserted claims below for certain grounds below, I state that the asserted claims are anticipated or rendered obvious by certain prior art references alone. This statement reflects my opinion that those prior art references anticipate such asserted claims because such prior art references disclose, expressly or inherently, every limitation of such claims. Because Ollnova has not disclosed any position in rebuttal to ecobee’s invalidity contentions in its response to ecobee’s Interrogatory No. 13, I cannot know what arguments, if any, Ollnova’s experts intend to raise in their expert rebuttal reports responding to this report, including what limitations, if any, Ollnova’s experts may contend are missing from the prior art references discussed below. However, to the extent Ollnova or its experts assert that any particular limitation is not expressly or inherently disclosed in such reference, that limitation would have been obvious at least in view of the disclosures set forth below and within those references. I expressly reserve the right to address any such arguments, and further demonstrate that the asserted claims are anticipated and/or obvious, including in view of the grounds discussed below.

47. In my opinion, the secondary considerations of non-obviousness put forward by Ollnova to date are unspecific, unconvincing, and fail to overcome the evidence of obviousness set forth elsewhere in this report. To the extent that Ollnova or their experts further refine their arguments regarding secondary considerations, I reserve the right to respond further.

48. Further, as set forth below, it is my opinion that the asserted claims recite conventional and generic components that are arranged and used in a well-understood, routine and conventional manner, including on their own and as they may be combined in the asserted claims.

49. I understand that Ollnova's experts have not yet served an expert report concerning alleged infringement by ecobee, and thus I do not know with certainty how they intend to interpret the claims for purposes of the infringement analysis. Depending on positions Ollnova's experts make take on the issues of claim scope and infringement, such positions, if accepted, may render one or more claims invalid under 35 U.S.C. § 112 for failing to meet the enablement and/or written description requirements. In particular, I understand that to satisfy the enablement requirement, the patent must reasonably enable a person of ordinary skill in the art ("POSITA") to practice the full scope of the claimed invention, as determined in view of the state of the art as it existed at the filing date of the application from which the patent issued. I further understand that a patent must contain a written description such that a POSITA would believe that the inventors had possession of the full scope of the claimed invention at the time of the application. If Ollnova's experts interpret the asserted claims such that the full scope of any claim is not adequately supported by a written description and/or not enabled, such claim would be invalid. I therefore expressly reserve the right to raise additional invalidity grounds (including grounds based on lack of enablement and/or lack of written description) in view of positions that Ollnova or its experts take in their

forthcoming expert reports concerning the scope of the asserted claims and/or alleged infringement by ecobee.

IV. LEGAL STANDARDS

50. I am not a lawyer, and am not opining regarding legal matters. In this section I describe my understanding of certain legal principles relevant to my analysis in this report. Counsel for ecobee has informed me of these legal principles.

A. Claim Interpretation

51. I have been informed by counsel that the property right protected by a patent is defined by the claims of the patent, which appear as numbered paragraphs at the end of the text. Each claim stands on its own when determining infringement and invalidity. These are the "metes and bounds" that define the scope of the property rights. Thus, the first steps in analyzing infringement or validity of a patent claim begins with an analysis of the claim itself, also referred to as "claim construction."

52. I understand that claims of a patent are interpreted from the perspective of a POSITA at the time of the invention in light of the intrinsic evidence, which includes the language of the claim itself, the specification of the patent, other claims of the patent and the relevant prosecution history from the USPTO. I understand that after reviewing the language used in the claim, the patent specification and prosecution history are reviewed to ensure that they do not alter the way one skilled in the art would understand a claim limitation. At times, the specification might provide further clarification as to the meaning of a claim limitation—including its plain and ordinary meaning as viewed from the perspective of the skilled artisan at the time of the patent's priority date.

53. To understand the perspective of the skilled artisan, one must determine the field of the art to which the patent pertains, and then the background of a POSITA. The POSITA is a hypothetical person who is presumed to have known the relevant art at the time of the invention. Factors that may be considered in determining the level of ordinary skill in the art may include: (1) type of problems encountered in the art; (2) prior art solutions to those problems; (3) rapidity with which innovations are made; (4) sophistication of the technology; and (5) educational level of active workers in the field.

54. In addition to claim language, patent specification and prosecution history—which are the preferred sources for claim construction—I understand that outside sources may be referenced to construe claim terms. I understand this evidence to be extrinsic evidence (e.g., dictionary meanings).

55. As noted above, it is my understanding the Court in this case has construed certain terms of the asserted claims, and that the parties have also agreed on certain claim constructions. I have applied the Court's construction and agreed constructions of those terms in my analysis herein. For any claim terms not construed by the Court or otherwise have agreed constructions by the parties, I apply the ordinary meaning of those terms as they would be understood by a POSITA as of the time of the invention.

B. Person of Ordinary Skill in the Art

56. I am informed by counsel that a POSITA is a hypothetical person who is used to analyze the prior art without the benefit of hindsight. I further understand from counsel that a POSITA is presumed to be one who thinks along the lines of conventional wisdom in the art and is not one who undertakes to innovate, whether by extraordinary insights or by patient systematic research.

57. I am informed by counsel that the hypothetical POSITA is presumed to have knowledge of (1) references that are sufficiently related to one another and to the pertinent art, and (2) the arts reasonably pertinent to the particular problem that the claimed invention addresses.

58. I have been informed by counsel that claim construction is viewed from the perspective of a POSITA in question at the time of the invention. For purposes of this report, I have been asked to assume a priority date of March 19, 2008, for the ’282 patent, April 12, 2006, for the ’887 patent, August 9, 2004, for the ’495 patent, and January 3, 2008, for the ’371 patent. Throughout this declaration, when I refer to POSITA, I am referring to one of ordinary skill in the art as of the appropriate date for the relevant patent, unless otherwise specified.

59. In my opinion, the level of ordinary skill in the art relevant to the asserted patents is that of one possessing at least a bachelor’s degree, or equivalent professional experience, in electrical engineering, computer science, computer engineering, or a related discipline, and at least 2 years of experience with automation, sensors, or controls systems, where appropriate experience and technical training may substitute for educational requirements, and advanced education may substitute for experience.

60. I have, and at all relevant times, met or exceeded the qualifications and expertise of a POSITA. While I consider my personal skills at the relevant time of the asserted patents to have been above the level of ordinary skill, in arriving at my conclusions for this report, I have considered the issues from the perspective of the POSITA as defined above. Thus, when I am discussing what a prior art reference discloses or suggests in this report, I am describing what I believe a POSITA would have understood as being disclosed or suggested by the prior art reference during the relevant time frame.

61. I understand that Ollnova's expert, Dr. Vijay Madisetti, has proposed a definition for a POSITA that is the same or substantially the same as the definition I have proposed above (*see* Declaration of Dr. Vijay Madisetti in Support of Plaintiff Ollnova Technology Ltd.'s Claim Construction Brief, ¶39). Therefore, to the extent there are any differences between our definitions, they do not impact my analysis herein in any way. To the extent that Ollnova or its experts disclose a different definition for a POSITA that materially differs in any way from the definition set forth above, I reserve the right to address such definition, including any impact it may (or may not) have on my opinions herein.

C. Prior Art Invalidity

62. I understand that a prior art product, patent, or other publication must first qualify as prior art before it can be used to invalidate a patent claim. I understand the America Invents Act ("AIA") changed the U.S. patent system in certain ways, but that I am to apply pre-AIA laws for patents that were filed before March 16, 2013, to determine what qualifies as prior art. I therefore understand that pre-AIA laws apply to all of the asserted patents.

63. For the purposes of this report, I generally understand that prior art is the body of knowledge publicly available to a person skilled in the particular art or field of the invention at the time the invention was made or one year prior to the filing of the patent application for the asserted patent. More particularly, I have been informed that prior art is defined as any reference that satisfies any of the § 102 subsections (a), (b), (e), and (g) regardless of whether or not the reference was actually known to those skilled in the art.

64. I understand that prior art under § 102(a) includes an invention (1) that was a matter of public knowledge within the United States or in use within the United States by anyone other than the applicant for patent, or (2) patented, or (3) described in a printed publication anywhere in the world before the invention by the applicant of the asserted patent. I understand that prior art under

§ 102(b) includes an invention, (1) patented, or (2) described in a printed publication anywhere in the world, or (3) in public use in the United States, or (4) on sale in the United States more than 1 year before the date to which the applicant is entitled by actual filing of the application in the United States. I further understand that prior art under § 102(e) includes an invention described in a patent on an application for patent by another filed in the United States before the invention by the applicant of the asserted patent.

65. It is my understanding that there are generally two ways that prior art references can render a patent claim invalid: anticipation and obviousness. Counsel has informed me all issued claims of a patent, including those I have reviewed for this report, are presumed valid. I have further been informed that, in order to establish a patent claim is invalid, the defendant has to establish, by clear and convincing evidence, that the claim is invalid. Counsel has informed me that clear and convincing means it is highly probable that the claim is invalid. In other words, when balancing the evidence, clear and convincing evidence requires that the scale tip heavily toward invalidity. I have further been told that this burden is not as high as "beyond a reasonable doubt," which is a higher evidentiary burden applicable in criminal cases.

D. Anticipation

66. I understand that a patent claim is not valid if it is not new. If a claim is not new in view of a prior art reference, it is considered to be "anticipated" by the prior art reference. My understanding is that a patent claim is anticipated if every feature or "element" of the claim is disclosed, expressly or inherently, in a single prior art reference.

67. I understand that there is a set process to determine anticipation (i.e., the claimed invention is not new or not novel under section 102 of the Patent Act). I understand that anticipation requires that: (1) the claims of a patent are properly construed, and (2) the claim language is then compared to the prior art on a limitation-by-limitation basis. If the prior art references contain all the elements

of the claim language (explicitly or inherently), arranged as in the claims, that is considered anticipation. For example, if a claim simply specifies the limitation A, B, and C arranged as required by the claim, the claim is anticipated. For a prior art reference to "teach" the limitations of a claims, a POSITA must recognize the limitations as disclosed, expressly or inherently, in that single reference, and to the extent the claim specifies a relationship between the limitations, the disclosed limitations must be in the same relationship between the limitations.

68. I understand that to anticipate a claimed invention, the prior art does not have to use the same words as the claim, but all of the requirements of the claim must have been disclosed, either stated expressly or implied to a POSITA in the technology of the invention, so that looking at that one reference, that person could make and use the claimed invention.

69. I am informed that an element of a claim may be disclosed inherently in a prior art reference if that element is necessarily present in the reference. I understand that there is no requirement that a POSITA would have recognized the inherent disclosure at the time of the invention, but only that the subject matter is in fact inherent in the prior art reference. I further understand that under the principles of inherency, if the prior art necessarily functions in accordance with, or includes the claimed limitations, it anticipates.

E. Obviousness

70. It is my understanding that that a patent claim can be invalid as obvious even if the invention is not identically disclosed or described in a single prior art reference. In such cases the claim is invalid if the differences between the claimed subject matter and the prior art reference are such that the claimed subject matter as a whole would have been obvious at the time the invention was made to a person of ordinary skill in the relevant art. I understand that obviousness can be based on a single prior art reference or a combination of references that, either expressly or inherently, teach all limitations of the claimed invention.

71. I understand that obviousness is viewed from the perspective of a POSITA at the time of the invention. This reference point prevents one from using hindsight in deciding whether a claim is obvious. For this reason, I have been asked to consider the level of ordinary skill in the field that someone would have had at the time of the claimed invention.

72. Counsel instructed me that in an obviousness determination the factors to consider are: (1) the scope and content of the prior art (some of this prior art is presented herein, and other content of such prior art comes from my decades of experience in the industry); (2) the differences between the prior art and the asserted claims (of which, as set forth in greater detail below, is minimal in this case); (3) the level of ordinary skill in the pertinent art; and (4) the existence of secondary considerations of non-obviousness, when present.

73. I understand that secondary considerations include: a long-felt but unmet need; commercial success; unexpected results; praise of the invention by others skilled in the art; licensing; deliberate copying; failure of others; and skepticism by experts.

74. I understand that the burden to establish the existence of secondary considerations lies with the patentee, who must establish a nexus between the challenged claim and any secondary considerations on which the patentee seeks to rely. Further, when considering secondary considerations, I understand that for any success of the invention to be relevant it must be attributable to the claimed invention rather than to other factors such as market power, advertising, demand for all products of a given type, a rising economy that helps all products, etc. I further understand that contemporaneous and independent invention by others is a secondary consideration that supports an obviousness determination. I further understand that when there is a strong showing of obviousness such that the inventions represented no more than the predictable

use of prior art elements according to their established functions, secondary considerations are inadequate to establish nonobviousness.

75. Counsel also instructed me that, although it is not required for a finding of obviousness, an obviousness inquiry may involve assessing the motivation of a POSITA to modify and/or combine references. For a claim to be obvious, all limitations of the claimed invention must be present in two or more prior art references, or in one or more prior art references combined with the common knowledge of a skilled artisan. Thus, if a claim specifies the limitations A, B, C, and only one references show A and B, then for this claim to be rendered obvious, C must be disclosed in a separate reference, or alternatively, must be part of the common knowledge of a POSITA. Further, the prior art references themselves may provide a suggestion, motivation, or reason to combine, but such a basis for combination need not come from the references themselves. However, I have been instructed that an explicit teaching, suggestion, or motivation need not be present in a reference to support combinability of references.

76. It is also my understanding through counsel that the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. It is further my understanding that a proper obviousness analysis focuses on what was known or obvious to a POSITA, not just the patentee.

77. I have been told that combinations of the prior art should be analyzed based on the mindset of a POSITA at the time the invention was made. Counsel has advised me that in rendering my opinions, I should cast my mind back to the time the patent was filed to occupy the mind of one skilled in the art at that time who is presented only with the references, and who is normally guided by the then-accepted wisdom in the art.

78. I understand that I am to perform the task referenced in the preceding paragraph without using "hindsight" reasoning. For example, it is improper to use the claim as a template for piecing together components (or steps) found in separate prior art reference. Instead, I was asked to consider the feasibility and combinability of references through the eyes of a POSITA—using common knowledge at the relevant time period for the asserted patent I have been asked to analyze. As I describe below, the individual references contain statements and teachings that motivate POSITAs to look to the other references in the combinations I was asked to consider.

79. I also understand that practical and common-sense considerations should guide a proper obviousness analysis, because familiar items may have obvious uses beyond their primary purposes. I further understand that a POSITA looking to overcome a problem will often be able to fit the teachings of multiple publications together like pieces of a puzzle (although this is not required). I understand that obviousness analysis may therefore take into account the inferences and creative steps that a person of ordinary skill in the art would employ under the circumstances.

80. I understand that relevant considerations for combining references include at least the following:

(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 techniques 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," which is 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 it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to a POSITA; and

(G) Some teaching, suggestion, or motivation in the prior art that would have led a POSITA to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

81. I have kept these considerations in mind when offering the opinions below regarding combinability, as well as when interpreting the scope and content of the references.

F. Enablement

82. I understand from counsel that a patent must "enable" a person of ordinary skill in the art to make and use the claimed invention. Enablement is met where a person of ordinary skill in the art, having read the specification, could practice the invention without undue experimentation.

83. I understand that the following factors are considered when determining whether a patent disclosure requires undue experimentation: (1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims.

84. I understand that to satisfy the enablement requirement, the patent must reasonably enable the full scope of the claimed invention. I further understand that enablement is determined in view of the state of the art as it existed at the filing date of the application from which the patent issued.

G. Written Description

85. I understand from counsel that a patent must contain a written description of the invention. This is because a patentee cannot claim what has not been described or invented. The written description must describe the invention such that a person of ordinary skill in the art would believe

that the inventors had possession of the full scope of the claimed invention at the time of the application.

86. I understand that the patent must demonstrate by disclosure in the specification, claims or drawings to those skilled in the art that, as of the filing date, the inventors were in possession of the full scope of the invention claimed. In this regard, the written description must actually or inherently disclose every claim element, and the full scope of the claimed subject matter as a whole.

87. I understand I understand that it is not enough to say that undisclosed subject matter would have been obvious to a POSITA.

H. Subject Matter Eligibility

88. I understand from counsel that subject matter may not be eligible for patent protection if it does not meet certain requirements under 35 U.S.C. § 101. I understand that a two-part inquiry is used to determine whether subject matter is patent-eligible. First, the claim is evaluated to determine whether it is directed to a patent-ineligible concept, such as an abstract idea. Second, if the claim is directed to an abstract idea, the claim is evaluated to determine whether there is an "inventive concept"—that is, whether an element or combination of elements in the claim is sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the ineligible concept itself. In this report, I have been asked to address the second part of this inquiry with respect to the Patents-in-Suit.

89. I further understand that claim limitations that merely recite generic computer implementations, or well-understood, routine, conventional activities previously known to the industry (such as the use of known computing or communication technologies), do not add sufficiently meaningful limitations that push the claim over the line from an abstract idea to a patentable one. I understand that to qualify as an inventive concept, a claim must recite a limitation

or combination of limitations that is significantly more than just claiming a patent on an abstract idea carried out using conventional technology. I understand that in performing such analysis, the claim elements should be considered individually and as an ordered combination.

V. PRIOR ART

A. U.S. Patent App. Pub. No. 2004/0008651 ("Ahmed")

90. U.S. Patent Application Publication No. 2004/008651 ("Ahmed") is entitled "Building System with Reduced Wiring Requirements and Apparatus for Use Herein."

91. On its face, Ahmed indicates that the underlying application was filed on January 28, 2003, and that Ahmed published on January 15, 2004, prior to the earliest priority dates of the '282 and '495 patents. I have been asked to assume that Ahmed is prior art to the '282 and '495 patents and do not offer a legal opinion as to whether Ahmed is prior art.

92. Ahmed is generally directed toward "providing a building control system that incorporates wireless communications and/or microelectromechanical ("MEMS") technology" (Ahmed, [0009]). Ahmed describes that the incorporation of wireless communications in a building control system will result in "at least some of the wiring employed for data communication may be eliminated," which would naturally lead to lower power consumption requirements and, for example, "[b]attery powered sensor modules [that] may be implemented completely within wiring" (Ahmed, [0009]). In the background section of the patent, Ahmed teaches that previous typical implementations in the prior art of building control systems that comprise wiring between system components have several drawbacks in large buildings; that is, "[a] large building may have hundreds of sensors, room controllers, and actuation devices" that "must be interconnected in some manner" for control operations to be carried out, resulting in "significant material cost" and labor intensive installation of wiring (Ahmed, [0007]). Thus, Ahmed proposes a controller

arrangement with wireless communications capabilities to allow for communications between sensor modules, actuator modules, and a controller, as shown in Figure 1 of Ahmed, reproduced below.

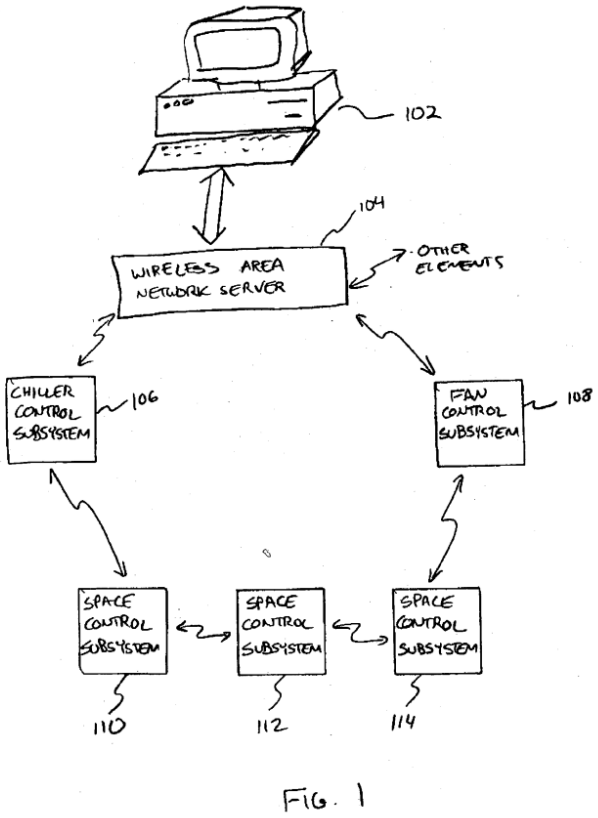


Figure 1 of Ahmed.

93. As shown in Figure 1 of Ahmed, the supervisory computer 102 of an exemplary building control system 100 is coupled on one side to a wireless area network server 104 to which several example control subsystems are also coupled on the other side, and this server "employs a packet-hopping wireless protocol to effect communication by and among the various subsystems" (Ahmed, [0024]). In the context of the building control system 100, each of the local space control subsystems 110, 112, and 114, "has multiple elements that communicate with each other using a second wireless communication scheme" (Ahmed, [0028]). Further, Figure 2 of Ahmed, reproduced below, shows a schematic block diagram of an example space control subsystem that

may be representative of a control system in a room within the building. The space control subsystem 110 includes a local radio frequency ("RF") communication scheme "such as Bluetooth" (Ahmed, [0028]) and includes a hub module 202 that includes a control processor with memory that is coupled to the wireless area network server 104 and a local RF communications device, two sensor modules 204 and 206, and an actuator module 208. Ahmed teaches that this "space control subsystem 110 is further operable to obtain data regarding the general environment of the room for use, display or recording by a remote device, not shown in FIG. 2, of the building control subsystem. (E.g., supervisory computer 102 of FIG. 1)" (Ahmed, [0029]).

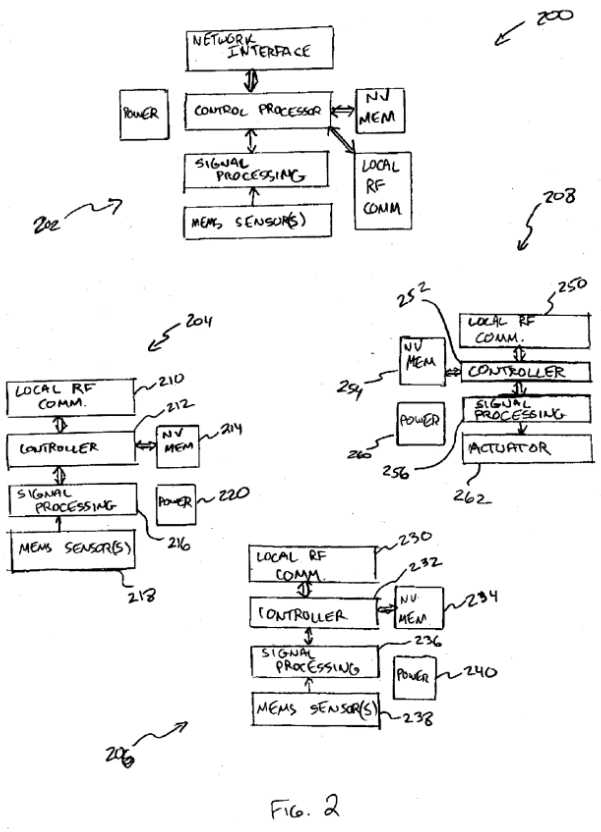


FIG. 2

Figure 2 of Ahmed.

94. Ahmed teaches that a chiller controller subsystem 106 may control the operation of a chiller plant and that its operation "may also be affected by set point values generated by the supervisory

computer 102" (Ahmed, [0025]). The generation of a set point by the supervisory computer 102 is not restricted to the chiller controller subsystem 106 and is generalizable to other controller subsystems, such as the space controller subsystem 110 of Figure 2. Ahmed teaches that in response to the controller processor 272 receiving a set point value from the supervisory computer 102 via the network interface 270, "[t]he control processor 272 then generates the control output value based on the set point values and one or more sensor values" (Ahmed, [0061]) in an automated fashion.

B. U.S. Patent App. Pub. No. 2006/0028997 ("McFarland")

95. U.S. Patent Application Publication No. 2006/0028997 ("McFarland") is entitled "Wireless Building Control Architecture." McFarland is the publication of an application that later issued as the '495 patent. On its face, McFarland indicates that the underlying application was filed on August 9, 2004, and that McFarland published on February 9, 2006, prior to the earliest priority date of the '282 patent. I have been asked to assume that McFarland is prior art to the '282 patent and do not offer a legal opinion as to whether McFarland is prior art. I have been informed that a publication may be prior art as of the date it was filed under 35 U.S.C. § 102(e).

96. In the background of the patent, McFarland explicitly references "U.S. patent application Ser. No. 10/672,527 titled 'Building Control System using Integrated MEMS Devices,' the disclosure of which is incorporated herein" (McFarland, [0004]). The U.S. patent application serial number 10/672,527 was published as U.S. Patent Application Publication No. 2004/0144849 ("Ahmed '849"). Ahmed '849 generally describes a component in a building automation system that comprises at least on microelectromechanical ("MEMS") sensor device and a processing circuit, which can take a sensor reading and wirelessly communicate the sensor information to another component in the system. Ahmed '849 explicitly cross-references "U.S. patent application Ser. No. 10/353,142, filed Jan. 28, 2003, and which is incorporated herein by reference" (Ahmed

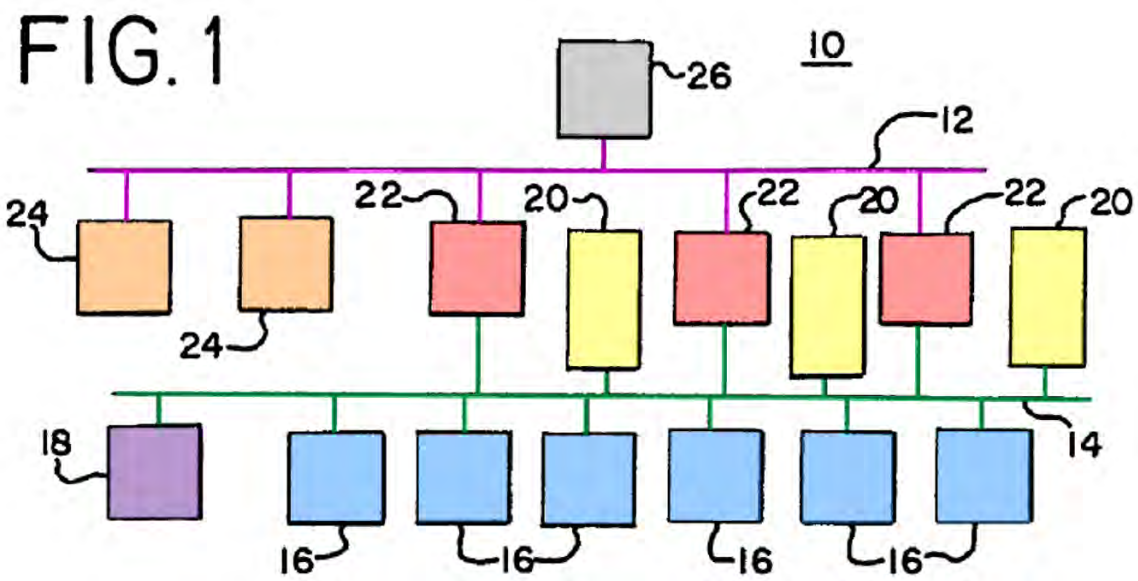
’849, [0002]). The U.S. patent serial number 10/353,142 was published as Ahmed. Therefore, through the explicit cross-referencing of Ahmed ’849 in McFarland and the explicit cross-referencing of Ahmed in Ahmed ’849, McFarland inherently incorporates the same or substantially the same teachings and disclosures of Ahmed.

97. McFarland itself is directed to “building automation systems. In particular, a wireless building control architecture [which] implements automation of building systems” (McFarland, [0001]).

98. More specifically, McFarland purports to disclose an architecture for a wireless building automation system that involves two “levels” or “tiers” of network. The disclosed network architecture comprises a “first wireless network” operable to enable direct communication between individual sensors and actuators which function independently as sensor-actuator groups to set their output state based on local sensor readings without coordinated control oversight from a controller. The disclosed network architecture further comprises a more-complex “second wireless network” operable to receive sensor output data and communicate with actuators while additionally capable of overriding the control activities of the first network, thereby imposing regional control that supersedes local sensor-actuator operation (*see*, e.g., McFarland, [0006]).

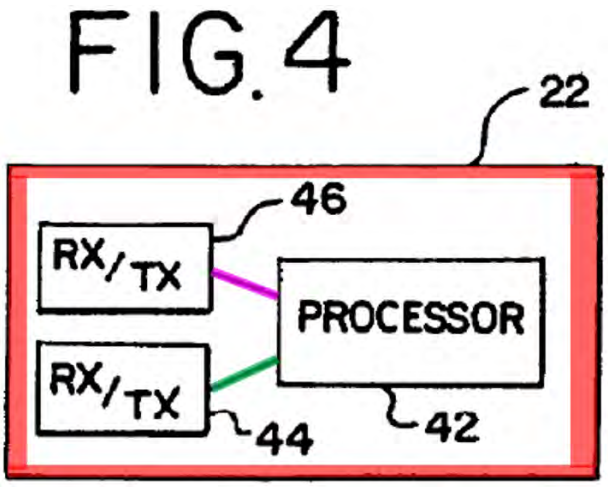
99. An embodiment of the disclosed multi-tier wireless building automation control system architecture is shown below in the annotated reproduction of Figure 1 from McFarland. In this figure, sensors (16), actuators (20), and other building devices (18) communicate over the lower level network (14), which also connects to controllers (22). Meanwhile, controllers (22), management processor or computer (26), and other devices (24) communicate over the high level network (12).

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Annotated version of Figure 1 from McFarland showing a multi-tier wireless building automation control system architecture, including a lower level network (green lines) and a high level network (pink lines).

100. The controllers (22) provide a connection between the higher and lower tiers of the network. McFarland claims the components of the lower level network may operate "free of input from separate controllers, such as the controller 22 of the high level network 12" (McFarland, [0050]). Additionally, McFarland claims that control processes of the lower level network may implement control processes with input from the controller 22 (*see* McFarland, [0050]). In this respect, "the controllers 22 implement region wide or other modification of local processes" (*see* McFarland, [0050]). The controllers disclosed by McFarland "include one or more processors 42 and two transceivers 44, 46" (McFarland, [0052]), as shown in the figure below, such that they may communicate with both the higher and lower level networks.



Annotated version of Figure 4 from McFarland showing a block diagram of one embodiment of a controller wherein said controller includes a transceiver for communicating on a lower level network (green line) and a transceiver for communicating on a high level network (pink line).

101. According to McFarland, the prior art systems that used a hub-and-spoke component arrangement were susceptible to single point failures (McFarland, Abstract, [0006]). McFarland's disclosed architecture implements (e.g., direct communications between sensors and actuators on one mode), where "[by] direct communication between sensors and actuators, the opportunity for a failed communications link using a hub and spoke arrangement may be avoided" (McFarland, Abstract, [0006]).[4] McFarland further states that certain embodiments are additionally directed to provide communication redundancy so that if the individual sensors and actuators within a group lose connection to each other, then the one or more processes implemented by the group still occur. Furthermore, embodiments comprising the two-tiered network architecture disclosed by McFarland also enable coordination of control activities outside of the individual sensor/actuator associations (i.e., for enabling the implementation of control processes in one group of actuators that cannot be implemented based on local sensor readings alone).

[4] As discussed below in Section VIII, McFarland's disclosed architecture and operations were themselves well known in the prior art and conventional, and thus not inventive at the time of McFarland's earliest priority date.

102. For instance, McFarland describes an example involving the detection of a fire, explaining that "corrective action begins within the immediate region of the sensor generating an alarm signal. The corrective action occurs without routing the alarm signal to upper levels of control processes or across different systems" (i.e., by a first level of architecture) (McFarland, [0007]). In this example, "the alarm signal is also propagated outward through the network to upper level control systems [i.e., a second tier of architecture] for generating appropriate responses in other zones" (*Id.*).

C. U.S. Patent App. Pub. No. 2005/0275530 ("Kates")

103. U.S. Patent Application Publication No. 2005/0275530 ("Kates") is entitled "Wireless Sensor System." On its face, Kates indicates that the underlying application was filed on May 27, 2004, and that Kates published on December 15, 2005, prior to the earliest priority dates of the '282, '887, and '371 patents. I have been asked to assume that Kates is prior art to the '282, '887, and '371 patents and do not offer a legal opinion as to whether Kates is prior art.

104. Kates broadly describes communications within a building automation system ("BAS"). In the description of related art, Kates teaches that sensors may be used to detect adverse conditions within a building; however, the incorporation of sensors adds additional wiring to support and power the sensors, which results in expensive installations in existing building to "install wiring between the remote sensors and a centralized monitoring device used to monitor the sensors" (Kate, [0004]). Therefore, Kates teaches a wireless sensor system that is low cost and robust that "provides an extended period of operability without maintenance," wherein intelligent sensors are used to detect anomalous conditions that can communicate with a base unit (Kates, Abstract). This general sensor system is also capable of contacting a supervisor or other responsible person to respond to an adverse condition, such as smoke, fire, or water. Figure 1 of Kates, reproduced

below, shows a sensor system that includes several remote sensor units 102-106 that are able to communicate with the base unit 112 via one or more repeater 110.

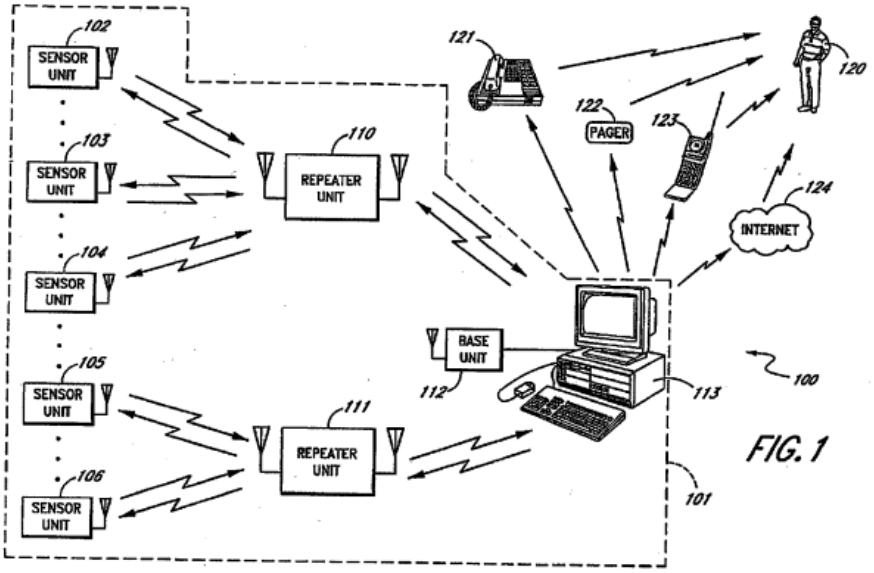


Figure 1 of Kates.

105. As shown in Figure 1 of Kates, the monitoring computer system 113 is coupled on one side to a local computer network connection (not displayed) to which several example sensor systems are also coupled on the other via repeater units 110 and 111, and this network connection may take on one of several types, "such as, for example, Ethernet, wireless Ethernet, firewire port, Universal Serial Bus (USB) port, Bluetooth, etc." (Kates, [0029]). Kates further teaches that when a sensor unit detects an anomalous condition, the sensor "communicates with the appropriate repeater unit" to provide information about the condition that is then "forward[ed] to the base unit 112" and then also forwarded by the base unit to the computer 113. More detailed descriptions of the sensor units described by Kates indicate that they do comprise a controller and power source, such as a battery, and may comprise an audio unit that may be used to signal a detected condition to personnel nearby to the sensor unit. In the sensor system described above, Kates further teaches that the computer 113 is able to "schedule different wakeup intervals to different sensor unit 102-106 based on the

sensor unit's health, power status, etc." (Kates, [0047]). This allows for the BAS to monitor sensor data at periodic intervals that is "based on the type of data and urgency of the data collected by the sensor unit" (Kates, [0047]).

D. U.S. Patent App. Pub. No. 2005/0017873 ("Liu")

106. U.S. Patent Application Publication No. 2005/0017873 ("Liu") is entitled "Apparatus for Detecting Environmental Conditions for a Structure or Article." On its face, Liu indicates that the underlying application was filed on June 10, 2004, and that Liu published on January 27, 2005, prior to the earliest priority date of the '282 patent. I have been asked to assume that Liu is prior art to the '282 patent and do not offer a legal opinion as to whether Liu is prior art.

107. Liu broadly describes a device that is able to measure and thus detect conditions external to the device. Liu teaches an apparatus that "comprises one or more sensors for sensing conditions at the component or articles and producing one or more signals and a wireless transmitter for wirelessly transmitting data based on the one or more signals to a remote device" (Liu, [0006]) in order to obtain environmental information that would be unobtainable by humans about a structure in a location. In addition to this device to sense environmental conditions, Liu teaches a "network for detecting environmental conditions for a structure" (Liu, [0006]). As such, Liu describes that "[w]ireless sensing nodes may be manufactured to create networks for gathering data from distributed sources where wiring would be too difficult, dangerous, or expensive to implement" (Liu, [0018]). Liu further teaches circuitry of a sensor node within such an apparatus in Figure 4, reproduced below.

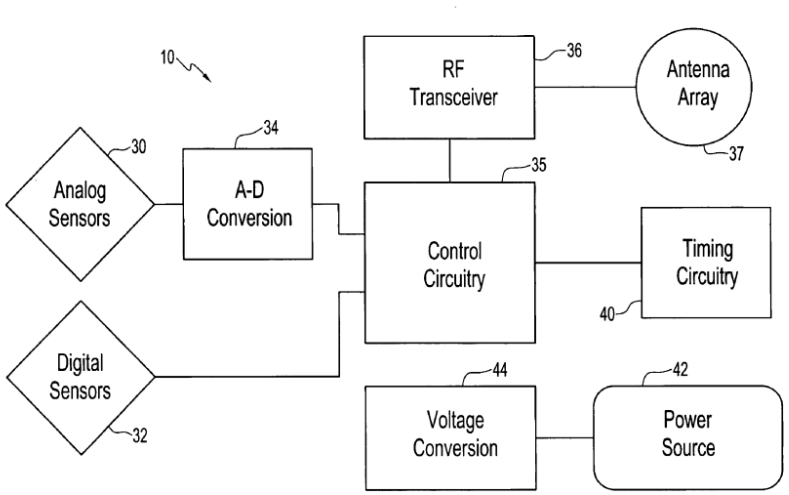


FIG. 4

Figure 4 of Liu.

108. As shown in Figure 4 of Liu, the patent teaches circuitry within a preferred sensor node 10, which may include sensors (e.g., digital and analog), an analog-to-digital converter 34, control circuitry 35 "for processing the signals from the sensors and producing a data stream, and may also decide what data if any will be transmitted, and/or take action based on commands from the hub 14 or the base 19" (Liu, [0033]), wireless communications circuitry including a radio-frequency transmitter 36 and antenna 37, timing circuitry 40, and a power source 42. As an example of the functionality of this circuitry, when considering a sensor node that incorporates a sleep mode, the control circuitry 35 queries if sensor data is to be stored, and if so, then stores the data "within a suitable non-volatile storage device" (Liu, [0048]).

E. U.S. Patent App. Pub. No. 2006/0152335 ("Helgeson")

109. U.S. Patent Application Publication No. 2006/0152335 ("Helgeson") is entitled "State Validation Using Bi-directional Wireless Link." On its face, Helgeson indicates that the underlying application was filed on March 6, 2006, and that Helgeson published on July 13, 2006, prior to the earliest priority dates of the '887 and '371 patents. I have been asked to assume that Helgeson is

prior art to the ’887 and ’371 patents and do not offer a legal opinion as to whether Helgeson is prior art.

110. Helgeson is generally directed to a wireless control system, such as a BAS, that includes master and remote units. Helgeson teaches an automated monitoring and control system in which “bi-directional radio frequency communication” exists “between master and remote units” (Helgeson, [0003]). Helgeson discusses that prior to the patent, remote units have “been hard wired to the master unit” (Helgeson, [0005]), which leads to inefficiencies such as higher costs associated with installation of new remote units, maintenance, and power consumption and the generation of false alarms. Thus, Helgeson introduces “a bi-directional wireless security, HVAC or other building monitoring system that allows communication between the master and remote units for increased reliability” and also suggests that the system have “one or more low power modes for conserving valuable power resources” (Helgeson, [0010]). A block diagram of a proposed system is shown in Figure 1 of Helgeson, reproduced below.

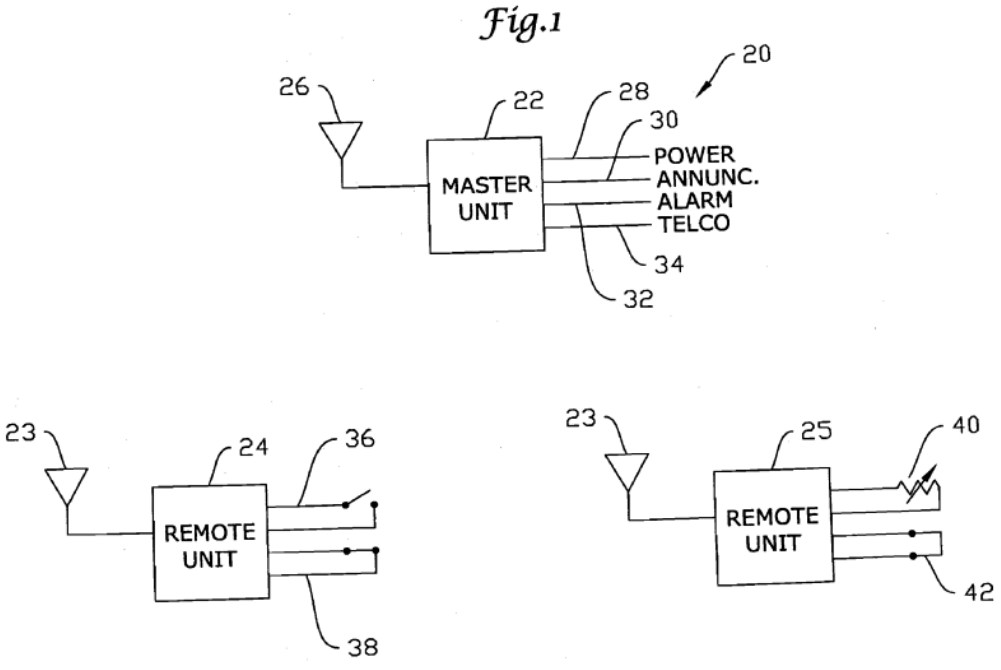


Figure 1 of Helgeson

111. As shown in Figure 1, Helgeson teaches a master and remote unit system comprising a master unit 22 and two remote units 24 and 25, wherein each type of unit includes an antenna, 23 and 26, respectively, the master unit "is commonly powered with AC line power" (Helgeson, [0023]) and has lines for an annunciator panel, device output, and a telephone, and the remote units have example sensors shown, such as open, closed, variable resistance, and security. The described system of Helgeson includes "a programmable microprocessor" (Helgeson, [0026]) in a remote unit and a programmable input line in the master unit that can be used for may purposes, including "down loading [*sic*] control logic," "inputting lines of BASIC or JAVA code to be interpreted and executed," and "control[ling] panel-mounted LEDs giving status information" (Helgeson, [0029]). Furthermore, Helgeson teaches an embodiment in which "remote units can be configured or programmed to transmit sensor data on a timeout occurrence or a change occurrence" in order to reduce power consumption, for example, "a temperature sensor can be configured to transmit every half-hour or upon a one (1) degree change" (Helgeson, [0032]).

F. U.S. Patent App. Pub. No. 2003/0137968 ("Lareau")

112. U.S. Patent Application Publication No. 2003/0137968 ("Lareau") is entitled "Monitoring and Tracking of Assets by Utilizing Wireless Communications." On its face, Lareau indicates that the underlying application was filed on December 20, 2002, and that Lareau was published on July 24, 2003, prior to the earliest priority dates of the '887 patent. I have been asked to assume that Lareau is prior art to the '887 patent and do not offer a legal opinion as to whether Lareau is prior art.

113. Lareau is generally directed toward the monitoring and tracking of assets via wireless communications. More specifically, Lareau teaches a RF identification ("RFID") tagging system as applied to asset tracking within a shipping hub; however, the monitoring methods disclosed are not limited to this application and may more generally apply to wireless monitoring systems.

Lareau teaches an asset monitoring system that "generally includes at least a first remote monitoring station (RMS)," wherein if multiple RMSs are part of the system, they can be "coupled together by a local area network (LAN) 140, so as to provide support for the system" (Lareau, [0036]). A schematic diagram of the monitoring system taught by Lareau is shown in Figure 5 of Lareau, reproduced below.

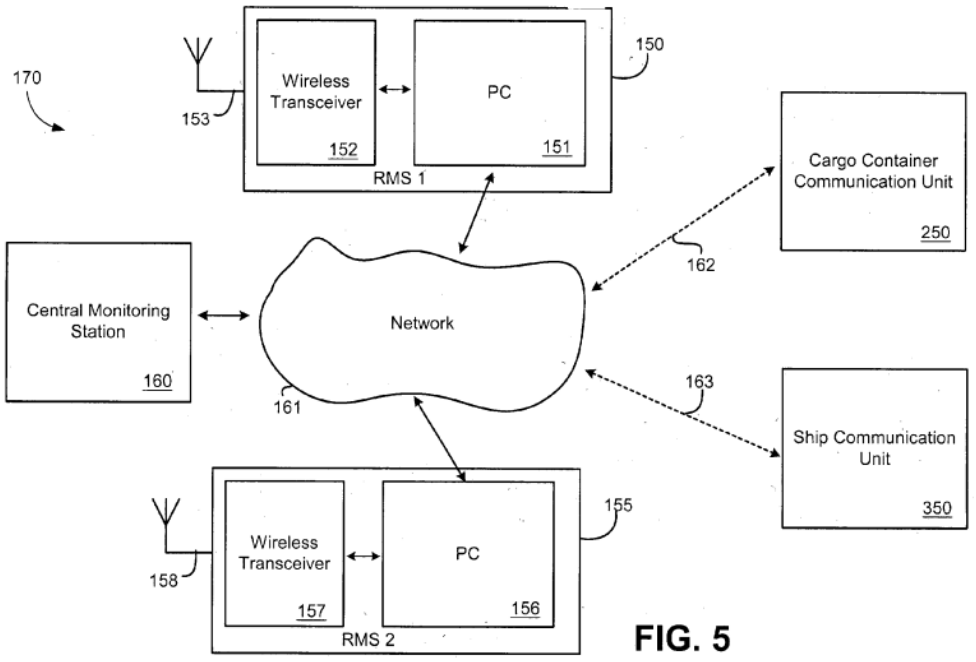


Figure 5 of Lareau.

114. As shown in Figure 5 or Lareau, a central monitoring station 160 is coupled to a network that connects with two RMS units 150 and 155, where each contains processing hardware and a wireless transceiver for wireless communications with RFID tags that are coupled to assets. In an embodiment of the asset monitoring system disclosed by Lareau, the RMSs communicate with RFID tags that are uniquely coupled to assets by sending requests for information to the tags, and thus "the RFID tags act as slaves to the RMS 150, the master" (Lareau, [0040]). An additional feature of tracking assets with an RMS is that "various sensors may be coupled to each asset and may connect to the tag also coupled to the asset," so that "environmental parameters may be

monitored and communicated to the RMS 150" (Lareau, [0046]). Further, Lareau teaches that "each tag in the network may be polled to see if any preprogrammed sensor thresholds have been exceeded since the last poll" (Lareau, [0050]), where the time between polling sensors is variable and "variable parameters may include the time between two successive sensor readings and threshold limits" (Lareau, [0076]). Furthermore, Lareau teaches that a typical RFID tag contains a processor for "executing software or firmware, particularly that stored in memory 410" (Lareau, [0068]).

G. U.S. Patent App. Pub. No. 2004/0122930 ("Pasternak")

115. U.S. Patent Application Publication No. 2004/0122930 ("Pasternak") is entitled "Lighting Control System and Method." On its face, Pasternak indicates that the underlying application was filed on June 13, 2003, and that Pasternak published on June 24, 2004, prior to the earliest priority date of the '495 patent. I have been asked to assume that Pasternak is prior art to the '495 patent and do not offer a legal opinion as to whether Pasternak is prior art.

116. Pasternak broadly describes a control system for the remote control of a load, wherein the control system includes a command controller, a communication controller, and wireless communications between more than one wireless network. Pasternak teaches such a control system in an example application, in which the system is used to control a remote lighting system; however, the control system is "not limited to controlling lighting and may be applied to controlling other electrical devices to reduce power consumption" (Pasternak, [0048]). In the background of the invention, the patent discusses the need for a centralized and remote monitoring and control of devices in a system. Thus, Pasternak discloses a "system for remotely controlling and/or monitoring remote devices via a common interface" (Pasternak, [0003]). In this system, a remote controller includes an interface module "that receives the command signal via the first wireless network and adapts the command signal for communication over a second wireless

network" and a second interface module "that transmits the adapted command signal" to control a load "in response to the adapted command signal" (Pasternak, [0032]). This system is shown in Figure 1 of Pasternak, reproduced below.

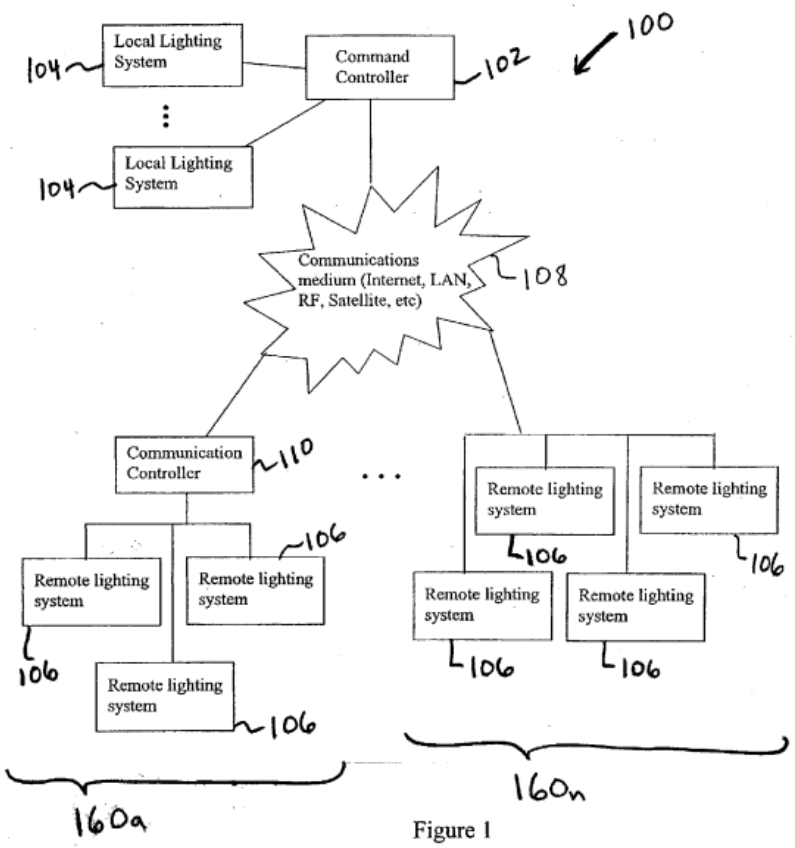


Figure 1 of Pasternak.

117. Figure 1 of Pasternak shows a control system wherein "[t]he command controller 102 bidirectionally communicates with the remote lighting [s]ystems 106 via a communications medium 108" (Pasternak, [0012]). The communications medium 108 connects the command controller 102 to the lighting systems 106 via one or more networking method, such as the Internet, local area networks, radio-frequency links, or other methods in one or more geographic locations. Pasternak also teaches that the command controller 102 may be locally proximate and thus connected to local lighting systems 104 via (e.g., direct wired connection), which illustrates that

"local lighting systems 104 are equivalent to the remote lighting systems 106 except for differences in their communication interface to the command controller 102" (Pasternak, [0015]).

H. U.S. Patent App. Pub. No. 2003/0151513 ("Herrmann")

118. U.S. Patent Application Publication No. 2003/0151513 ("Herrmann") is entitled "Self-organizing Hierarchical Wireless Network for Surveillance and Control." On its face, Herrmann indicates that the underlying application was filed on November 21, 2002, and that Herrmann published on August 14, 2003, prior to the earliest priority date of the '495 patent. I have been asked to assume that Herrmann is prior art to the '495 patent and do not offer a legal opinion as to whether Herrmann is prior art.

119. Herrmann generally describes the operation of a wireless network of sensors and actuators. The patent discloses a hierarchical network of sensors and actuators as applied to surveillance and control of a building, but is not limited to this application. Herrmann teaches a "hierarchical ad-hoc [*sic*] network absent a central control unit" that "may include devices with different types with varying complexity and functionality" (Herrmann, [0015]). The described network may include various types of network nodes, classified into various device types: Class 0 (sensor/actuator powered by a power-line); Class 1 (sensor/actuator powered by a battery); Class 2 (sensor/actuator powered by a battery with limited capabilities); and Class 3 (sensor/actuator powered by a battery that is not a fixed node or an RF transmitter), as well as a cluster head and panel. A panel is a top-level device such as a computer or software program with a user interface that may be in communication with a transceiver on a cluster head, "either though a local area network (LAN), or through a dedicated wire-based or wireless link" (Herrmann, [0030]). A schematic drawing of an example hierarchical network is shown in Figure 2 of Herrmann, reproduced below.

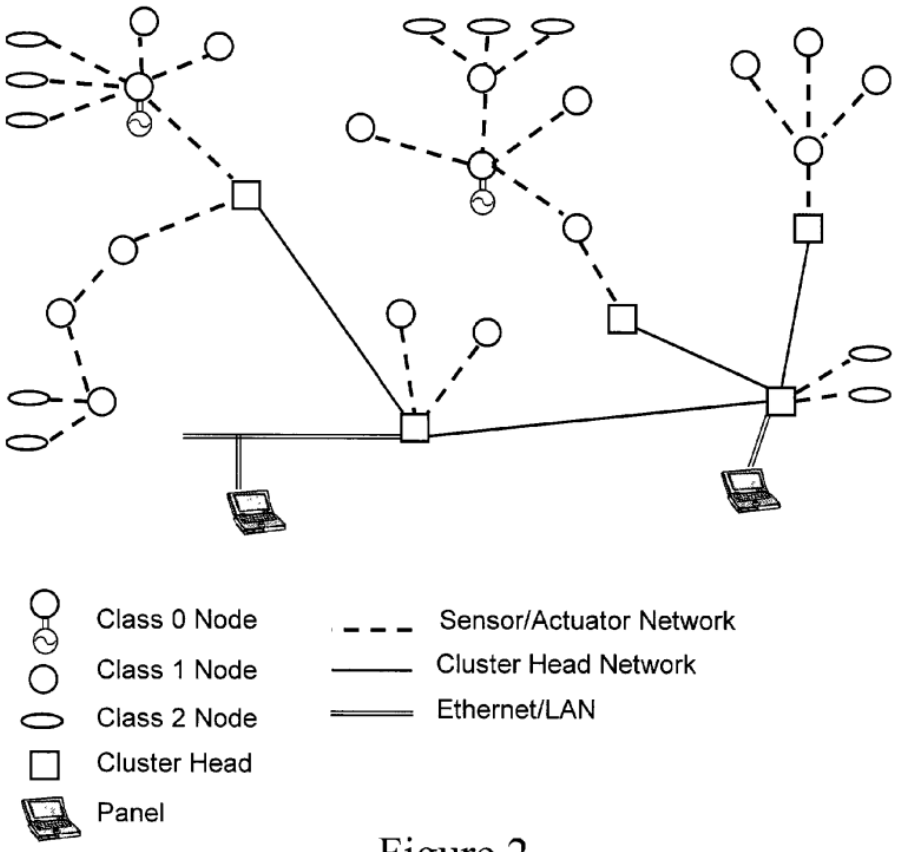


Figure 2

Figure 2 of Herrmann.

120. Herrmann teaches that "[c]luster heads are dedicated network control nodes" that "may additionally but not necessarily perform sensor or actuator functions" (Herrmann, [0026]). Cluster heads are distinct from devices in the previously described classes in that they may "have a significantly more powerful microcontroller and more memory," they "may not be as limited in energy resources," and they may include one or more radio modules (Herrmann, [0026]). More specifically, Herrmann teaches that cluster heads may "include a short or medium range radio module ('Radio 1') for communication with the sensor/actuator nodes" and that they may also "include a second RF transceiver ('Radio 2') with a larger bandwidth and/or longer communication range" than the Radio 1 (Herrmann, [0026]). These two radios are described as comprising distinct networks, one being the sensor/actuator network, in which one cluster head is wirelessly connected

to various sensors and actuators of different types, and another the cluster head network, in which cluster heads are able to communicate between each other.

121. The patent of Herrmann further teaches that signals may be transmitted between the cluster head network and a sensor/actuator network; however, communication between cluster heads is not required for sensors and actuators to operate in a network. That is, "the microcontroller of the cluster heads may run several software programs to coordinate the communication with other cluster heads (as may be required, for example, by the cluster head network), to control the sensor/actuator network, and to interpret and store information retrieved from sensors and other cluster heads (database)" (Herrmann, [0074]).

I. U.S. Patent No. 8,984,500 ("Mesarina")

122. US Patent No. 8,984,500 ("Mesarina") is entitled "Programming a Computing Node Connected to a Sensor and an Actuator." On its face, Mesarina indicates that the underlying application was filed on June 14, 2004 (prior to the earliest priority date of the '495 patent), published as US Patent Publication No. 2006/0031426 on February 9, 2006, and issued as Mesarina on March 17, 2015. I have been asked to assume that Mesarina is prior art to the '495 patent and do not offer a legal opinion as to whether Mesarina is prior art.

123. Mesarina is generally directed to the programming of a computing device that is connected to a sensor and an actuator. In an embodiment described in the patent, "[t]he computing node receives a module which is used to program the computing node to perform a function associated with the sensor and the actuator" (Mesarina, Abstract). In the background section, Mesarina discusses that prior to the patent, the installation of a large sensor system in, for example, a building, using a centralized computer to control the sensors and actuators "becomes a bottleneck, which may delay data processing and thus delay control of actuators in the system" (Mesarina, 1:31-32). Thus, Mesarina teaches a "sensor system 100, according to an embodiment, which

includes computing nodes 20 that may be programmed by a server 10 using modules" (Mesarina, 2:18-20), shown in Figure 1 of Mesarina, reproduced below.

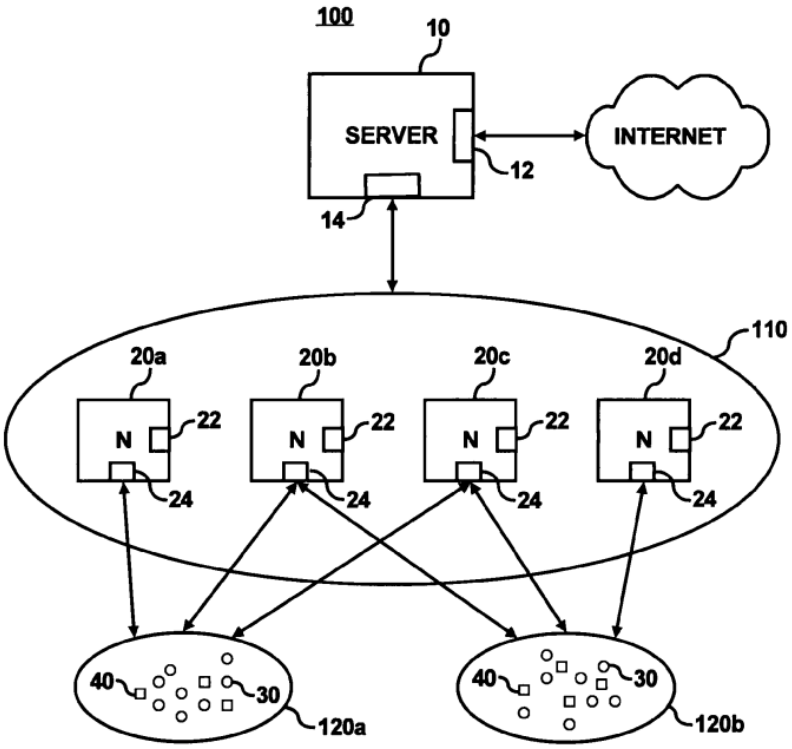


FIG. 1

Figure 1 of Mesarina.

124. As shown in Figure 1 of Mesarina, the sensor system 100 comprises a server 10 that may include a wide area network ("WAN") interface "for connecting the server 10 to a WAN, which may include the Internet" (Mesarina, 2:23-25), a wireless computing node network 110, and wireless sensor networks 120a and 120b. Generally, the server "generates modules including functions and relationship for programming the computing nodes 20" (Mesarina, 2:28-30). The computing node network 110 is typically a LAN that can be used to transmit modules from the server to the computing nodes 20, which are devices "operable to perform a function using information received from a sensor, i.e., sensor data" (Mesarina, 2:35-36). Mesarina further

teaches wireless sensor networks 120a and 120b that connect sensors and actuators to the computing nodes 20. Additionally, Mesarina teaches differences between the computing node network and sensor networks, such as the local sensor network "may be a low-power wireless network used in the computing network 110, and thus a low-power wireless network may be used to conserve energy and maximize battery life" (Mesarina, 3:16-21).

J. U.S. Patent App. Pub. No. 2004/0100394 ("Hitt")

125. US Patent Application Publication No. 2004/0100394 ("Hitt") is entitled "Distributed Environmental Control in a Wireless Sensor System." On its face, Hitt indicates that the underlying application was filed on October 24, 2003, and that Hitt published on May 27, 2004, prior to the earliest priority date of the '371 patent. I have been asked to assume that Hitt is prior art to the '371 patent and do not offer a legal opinion as to whether Hitt is prior art.

126. Hitt generally describes the implementation of an array of sensor and actuator nodes into a wireless control system network. Generally, a wireless environmental monitoring and control system is described wherein there are sensor nodes, actuator nodes, monitor nodes, gateway nodes, and repeater nodes, although some of these may serve multiple purposes and combine, for instance, the sensor and repeater functionality in one node. In each device, "[t]he wireless transceiver of each wireless node may communicate with a memory 155 that stores a unique transceiver identifier that identifies the wireless network" (Hitt, [0046]).

127. Hitt discloses "[a] method for providing environmental monitoring and control includes providing a network of wireless nodes, the wireless nodes include[] an array of sensor nodes and an array of actuator nodes, each wireless node including a wireless transceiver, a processor and one of a sensor device or an actuator device" (Hitt, Abstract). The disclosed method "includes sending a message from a first wireless node to a second wireless node through wireless communication; and processing the message at the second wireless node," where "the message

may include sensor data or a control command operative to control the sensor device or the actuator device in the second wireless node" (Hitt, Abstract). Within the disclosed method, each wireless node (which can be, for example, a sensor node or an actuator node) is an automation component configured for wireless communication. This is illustrated, for example, in Figures 2 and 2A.

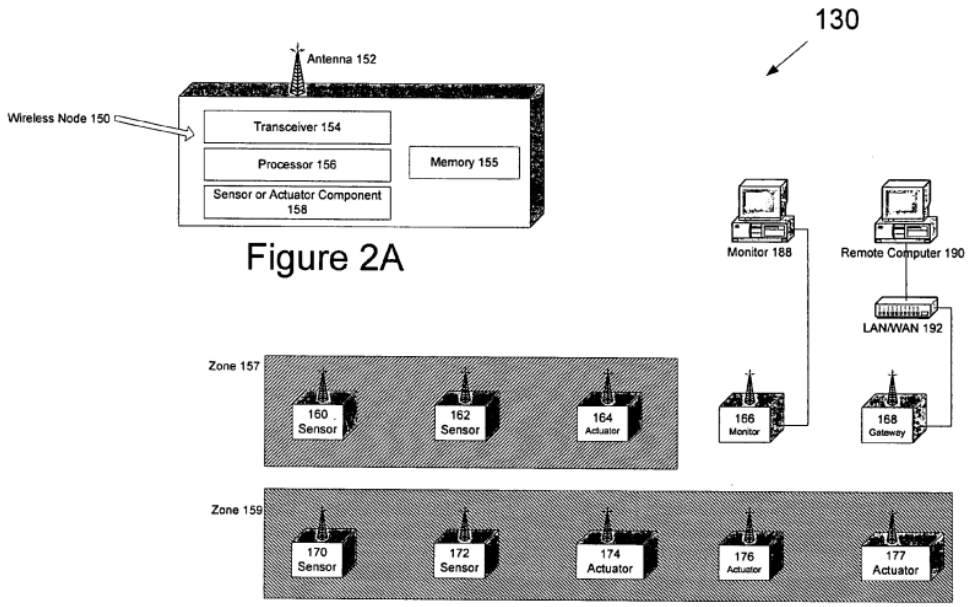


Figure 2A

Figure 2

Reproduction of Figures 2 and 2A from Hitt.

128. Hitt emphasizes the importance of power conservation in its disclosed system and method. For example, Hitt explains that "the wireless nodes, whether a sensor node or an actuator node, are typically battery powered or solar powered and thus power conservation is critical" (Hitt, [0075]). Therefore, "[i]n accordance with one aspect of the present invention, a scheduled transmission protocol is implemented in the environmental monitoring and control system for promoting efficient power use and power conservation" (Hitt, [0075], emphasis added).

129. For example, Hitt discloses that that either the receiving node or the sending node can schedule transmission timeslots or negotiate timeslots for transmission (Hitt, [0076]-[0078]). Hitt

discloses that, for example, where a receiving node schedules a transmission slot, "[t]he sensor nodes send message packets at scheduled times and the receiver node responds to transmissions with an acknowledge packet," where "[t]he acknowledge packet contains the timing information for the sensor nodes' next scheduled packet transmission and the next frequency of transmission (if frequency hopping is used)" (Hitt, [0076]). Hitt explains that "[t]he benefit of this protocol is that the sensor nodes and receiver nodes can sleep until the next scheduled transmission slot, saving a tremendous amount of power" (Hitt, [0076]). Likewise, the sending nodes can also provide the transmission schedule (Hitt, [0077]).

130. Hitt further discloses exemplary flowcharts for transmission schedules in Figures 4 and 6, where information is retransmitted repeatedly or until an acknowledgment packet is received to ensure reception at the intended device.

VI. INVALIDITY OF US. PATENT NO. 8,224,282 ("the '282 Patent")

A. Summary of the '282 Patent

131. The '282 patent, titled "Method and device to manage power of wireless multi-sensor devices," was filed on March 18, 2009, was published on July 17, 2012, and claims a priority date of March 19, 2008, based on a U.S. Patent Provisional Application No. 61/037,739.

132. The '282 patent broadly describes the communication of information between wireless devices within a BAS. Generally, an automation component that is intended to be configured for wireless communications is described wherein the component includes multiple sensors, a wireless communications component, and a processor with memory that interfaces with both the wireless communications component and the sensors. The configuration of these elements is broadly illustrated in Figure 2 of the '282 Patent, reproduced below.

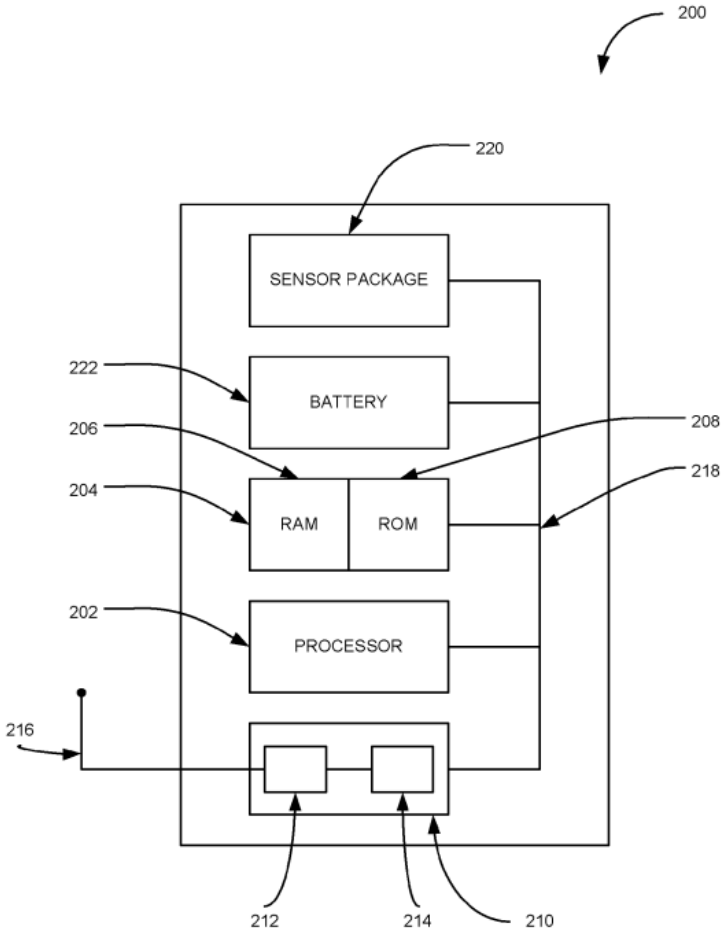


FIG. 2

'282 Patent, Figure 2.

133. As shown in Figure 2, the '282 patent discloses "an exemplary automation component 200 that may be utilized withing the control system 100" (the '282 Patent, 5:52-53) that includes a multi-sensor package 220, battery 222, a processor 202 that is "in communication with a memory 204 or storage medium" (the '282 Patent, 5:61-62), and a communications component 210, which may "contain a wireless transmitter 212 and a receiver 214 communicatively coupled to an antenna 216" (the '282 Patent, 6:5-8), allowing for wired and/or wireless communications with other automation devices. However, wireless communications between automated devices within a control system were common practice in the field at the time of the patent, as stated in the

background of the patent: "[w]ireless devices, such as devices that comply with IEEE 802.15.4/ZigBee protocols, may be implemented within the control scheme of a building automation system without incurring additional wiring or installation costs" (the '282 Patent, 1:63-67). Such an automation component "may be utilized interchangeably with the automation components 110, 112, and 116" (the '282 Patent, 5:55-56) within a networked system of automated components, an example of which is shown in Figure 1 of the '282 Patent, reproduced below.

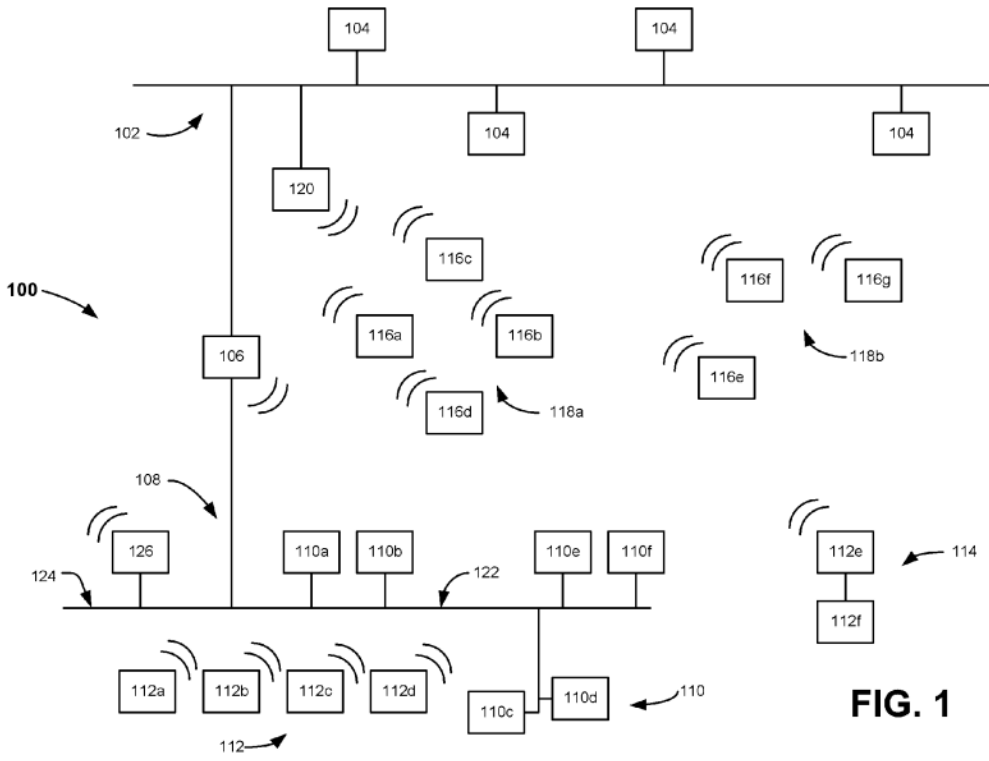


Figure 1 of the '282 Patent.

134. The automated component network shown in Figure 1 of the '282 patent comprises a BAS with at least the following components: a first network 102 "in communication with one or more controllers such as a plurality of terminals 104 and a modular equipment controller (MEC) 106" (the '282 Patent, 4:51-54); a second network 108 that may include wired network portions 122 and 124 "that connect to building automation components 110" (the '282 Patent, 4:59-60); and wireless

automation components 112 and 116. Within the system of automated components described by the ’282 patent, the communication of sensor information collected by the wireless automated components has the following limitations disclosed by the ’282 patent: polled communications between automation components, push communications regarding change-of-values (“COV”) as detected by a sensor package, and power saving functionality “to extend and/or maximize the operating life of wireless devices and the network in which they operate” (the ’282 Patent, 2:17-19). At the time of the invention, a POSITA would have been able to implement each of these limitations within a hybrid wired-wireless control system of a BAS comprising automated components containing multiple sensors.

135. Regarding the polled communication functionality of the BAS, the ’282 patent discloses a poll communication algorithm that may be implemented, for example, between two automation components in which the automation component “may generate and communicate a change-of-value (COV) request message to one or more automation components 200b operating withing the BAS” (the ’282 patent, 7:6-8). Upon receipt of the COV request message, the second component “may generate a COV acknowledgement message for communication” to the first component (the ’282 patent, 7:19-20). Additionally, the second automation component “will check, at regular intervals established by an internal COV Reporting time interval or as needed by the internal algorithm” (the ’282 patent, 7:54-56), for COVs of the sensors within the first automation component, which can be used as control information “that are controlling and driving the receiving device” (the ’282 patent, 9:15-16).

136. During prosecution of the application that issued as the ’282 patent (i.e., U.S. Patent Application No. 12/406,799), the examiner identified three references that named a common inventor (Thomas D. Petite). The examiner found that the applicants’ proposed claims were

anticipated in view of one such reference, U.S. Patent No. 6,437,692 ("Petite"), and issued two office actions explaining this anticipation *(see* September 14, 2011, Non-Final Office Action; December 22, 2011, Final Office Action). In response to these rejections, the applicants argue that Petite discloses a single sensor capable of sensing multiple properties, but that it does not disclose the claimed "multi-sensor package" (*see* December 12, 2011, Response to Non-Final Office Action; April 20, 2012, Response to Final Office Action). During the course of the prosecution, the applicants amended certain claims to require that the recited multi-sensor package is configured to detect a plurality of variables and generate sensor data for each detected variable, or contain a plurality of sensors. The applicants did not argue that any other limitation was missing from Petite. In response to these arguments, on May 3, 2012, the examiner issued a Notice of Allowability and allowed the claims to issue.

137. As demonstrated below, use of a "multi-sensor package" in building automation systems was well known at the time, including in view of at least Ahmed and McFarland. Neither Ahmed nor McFarland were before the examiner during prosecution of the application that issued as the '282 patent.

138. I understand that on March 6, 2023, Emerson Electric Co. ("Emerson") filed a petition for *inter partes* review with the USPTO seeking to invalidate certain claims of the '282 patent, including some of the asserted claims (IPR2023-00624, Petition). In the petition, Emerson asserted that one or more claims are anticipated or obvious over, among other art, McFarland. I understand that, as of the date of this report, Ollnova has not responded to the petition, and the USPTO has not issued an institution decision. I reserve the right to provide further opinions concerning this proceeding as further events occur.

B. Claim Construction for the ’282 Patent

139. I understand that the following terms found in the ’282 patent asserted claims have been construed by the Court or have a construction that was agreed upon by the parties.

Claim Term	Construction
“receive sensor control information related to sensor data in control at a second automation component in communication with the building automation system” (’282 patent, claim 1)	“receive information that identifies which sensor or sensor value is driving or controlling a second automation component in communication with the building automation system”
“[first/second] automation component” (’282 patent, claims 1, 5, 7, 11, 13, 19, 20)	“[first/second] component designed to operate without human interaction in an automation system”
“a multi-sensor package” (’282 patent, claims 1, 7, 13, 20)	“a single packaged sensor device, not a group of individual sensors”

C. Claims 1 and 6 of the ’282 Patent are anticipated or obvious to a POSITA in view of Ahmed

i. Claim 1

140. Claim 1 of the ’282 Patent recites:

> An automation component configured for wireless communication within a building automation system, the automation component comprising:
>
> a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable;
>
> a wireless communications component;
>
> a processor in communication with the wireless communications component and the sensor package;
>
> a memory in communication with the processor, the memory configured to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor; wherein the computer readable instructions are programmed to:

receive sensor control information related to sensor data in control at a second automation component in communication with the building automation system; and

communicate a portion of the stored sensor data corresponding to the received sensor control information to the second automation component.

141. Thus, claim 1 of the ’282 patent is directed towards a wireless automation component within a building automation system, and includes limitations pertaining to selective communication of sensor data between different automation components within the building automation system. For at least the reasons detailed below, each and every limitation of claim 1 of the ’282 patent is disclosed by Ahmed, and, consequently, this claim is invalid as anticipated or obvious to a POSITA in view of Ahmed.

a. **1[pre] An automation component configured for wireless communication within a building automation system, the automation component comprising:**

142. To the extent that the preamble of claim 1 of the ’282 is limiting, Ahmed discloses an automation component configured for wireless communication within a building automation system for at least the following reasons.

143. Ahmed discloses a wireless network of automation components within a building. For example, the abstract of Ahmed describes “[a] controller arrangement for a building system” which includes “a sensor module, an actuator module, and a controller,” wherein “[t]he sensor module comprises a wireless communication devices and a microelectromechanical system device operable to generate a process … [t]he actuator module comprises an actuation element and a wireless communication device … [t]he controller is operable to obtain the process value from the sensor module and provide a control output to the actuator module, the controller further operable to communicate with at least one of the sensor module and the actuator module using a wireless

communication device." Thus, Ahmed discloses a network of sensor devices, actuator devices, and controller devices, each of which may be an automation component as required by the preamble of claim 1 of the '282 patent, and describes that these devices communicate wirelessly to enable actuators to be controlled based on signals from sensors.

144. More specifically, figure 1 of Ahmed (reproduced below), shows "a block diagram of an exemplary building control system" (Ahmed, [0013]) that includes "a wireless area network server 104, a chiller controller subsystem 106, a fan controller subsystem 108, and room controller subsystems 110, 112, and 114" and Ahmed is clear that this building control system is merely an example, stating that "[t]ypical building control systems will include many more space control subsystems as well as many more chiller, fan, heater, and other building HVAC systems" (Ahmed, [0023]).

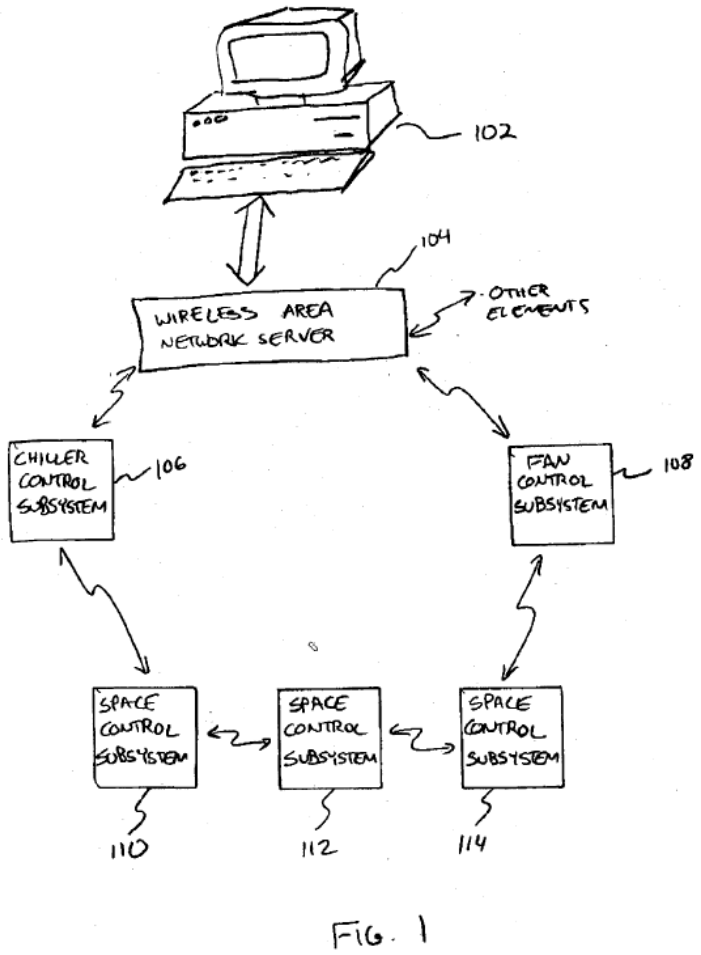


FIG. 1

Reproduction of Ahmed figure 1.

145. Thus, Ahmed discloses a wireless area network that connects various control subsystems, where each control subsystem may be comprised of several automation components configured for wireless communication with the building control system. Indeed, in reference to "room controls 110, 112, and 114 of figure 1," Ahmed describes that these subsystems are "local controller subsystems that operate to control an environmental aspect of a location or 'space' within the building" (Ahmed, [0027]) and that "each of the space control subsystems 110, 112 and 114 has multiple elements that communicate with each other using a second wireless communication scheme such as Bluetooth" (Ahmed, [0028]).

146. Furthermore, figure 2 of Ahmed (reproduced below) shows "a schematic block diagram of an exemplary room control system that may be used as the space control subsystems 110" (Ahmed, [0028]) that includes a "hub module 202," two "sensor modules 204 and 206," and one "actuator module 208" (Ahmed, [0029]). In an example embodiment discussed within Ahmed, the room control system of figure 2 is configured to control HVAC equipment whereby "[t]he first sensor module 204 represents a temperature sensor module and is preferable embodied as a wireless integrated network sensor" (Ahmed, [0030]), "[t]he sensor module 206 is configured to operate as a flow sensor" (Ahmed, [0044]), and "[t]he actuator module 208 … is operable to control the position of a ventilation damper, thereby controlling the flow of heated or chilled air into the room" (Ahmed, [0045]; *see also*, Ahmed '849, Fig. 7).

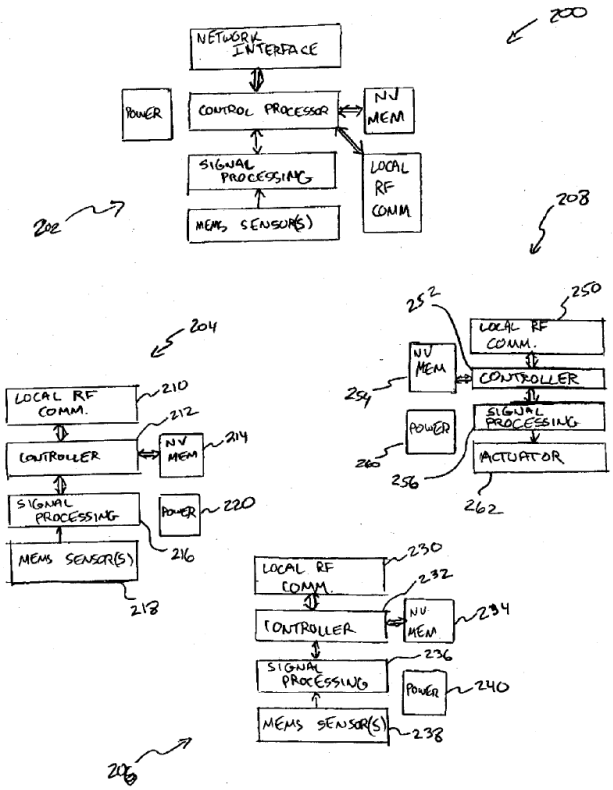


FIG. 2

Reproduction of Ahmed Figure 2.

147. Thus, each of modules 202, 204, 208, and 206 constitute example "automation components" as required by claim 1 of the '282 patent. Moreover, the hub module 202 including a "network interface" to communicate with other hub devices as well as "local RF comm" to wirelessly communicate with other modules; and modules 204, 208, and 206 also include "local RF comm" to allow wireless communication between modules (*see also*, Ahmed Figure 7 showing the "RF Comm" component); and Ahmed describes these modules as constituting parts of a building control system which function to autonomously control the environment within "spaces" or "rooms" in a building. Therefore, Ahmed discloses automation components that are configured for wireless communication within a building automation system.

148. Consequently, for at least the reasons above, to the extent that the preamble of claim 1 of the '282 patent is limiting, it is my opinion that Ahmed discloses the requirements of this preamble.

149. In addition, regarding the claim term "[first/second] automation component," to the extent that this term applies to the "an automation component" of the claim 1 preamble, I have applied the Court's construction for this term in forming my opinions. More specifically, the Court has ordered that the term "[first/second] automation component" be construed to mean "[first/second] component designed to operate without human interaction in an automation system" and I have applied this construction in my analysis. The modules of Ahmed are used within a building control system to autonomously control the environment within a room of the building by operating actuator modules based on information from sensor modules, and thus operate without human interaction when performing their usual function. In any event, Ahmed discloses a control subsystem consisting of temperature sensors, actuators, and controllers for controlling HVAC equipment—that is, Ahmed discloses autonomous components consistent with my understanding of Ollnova's accusations, which purport that a thermostat controller and/or associated remote

temperature sensors are allegedly automation components that satisfy claim 1 of the ’282 patent. In other words, in the event that Ollnova argues that Ahmed does not disclose the claimed autonomous components as construed by the Court, it should be noted that not only does Ahmed disclose automation components according to the Court’s construction, but these disclosures also satisfy Ollnova’s own infringement theories as I understand them.

b. **1[a] a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable;**

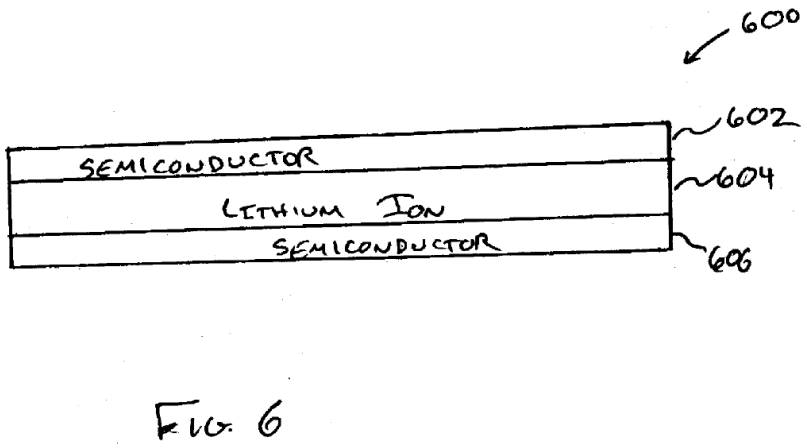
150. Ahmed discloses wireless automation components that include a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable, for at least the following reasons.

151. As discussed in relation to the preamble of claim 1, Ahmed discloses a wireless building control system comprised of multiple “space control subsystems” networked together; where each space control subsystem is comprised of a hub that can wirelessly communicate to other subsystems as well as sensor modules and actuator modules within the local subsystem; and where each hub and module constitute an automation component of claim 1 of the ’282 patent.

152. Ahmed also discloses that sensor modules can comprise multiple different sensors, each for sensing different variables, packed together into a sensor suite. More specifically, in reference to MEMS sensor module 218 within an example sensor module, Ahmed discloses that “[t]he MEMS sensor device(s) 218 include at least one MEMS sensor, which may suitably by a temperature sensor, flow sensor, pressure sensor and/or gas-specific sensor. In a preferred embodiment, several sensors are incorporated into a single device as a sensor suite 218” (Ahmed, [0032], emphasis added).

153. In yet more detail, Ahmed discloses that the several different sensors within a sensor suite may be fabricated onto a single semiconductor substrate. For instance, in relation to figure 6

(reproduced below), which shows "a side view of an exemplary wireless module" (Ahmed, [0018]) that is an example "single substate or single device solution for the sensor module 204" (Ahmed, [0031]), Ahmed states "a set of selectable sensor devices may further include, by way of example, a light sensor, a heat or smoke sensor, a movement sensor, and/or a biometric sensor … In accordance with one aspect of the invention, several known MEMS sensing technologies are incorporated into a single substrate" (Ahmed, [0033], emphasis added).



Reproduction of Ahmed figure 6.

154. At least because Ahmed discloses incorporating several MEMS sensors on the same semiconductor substrate and packaging this within a single sensor module, Ahmed discloses "a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detector variable." Indeed, a POSITA would recognize that integration of different sensors within a single substrate necessitates that these different sensors are packaged together, since otherwise the packaging would necessarily divide the semiconductor material into more than one substrate. Consequently, for at least the reasons above, it is my opinion that Ahmed discloses the requirements of claim element 1[a] of the '282 patent.

155. In addition to satisfying the requirements of the claim language as these would be understood by a POSITA, Ahmed also satisfies the position within Ollnova's infringement

contentions pertaining to claim element 1[a] of the ’282 patent. More specifically, Ollnova’s contentions do not address the packaging of multiple sensors at all, and instead contends that each ecobee thermostat comprises a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detector variable merely because ecobee thermostats include temperature, humidity, occupancy, and proximity sensors. As discussed above, Ahmed explicitly discloses that the modules therein include several different sensors, and to the extent that Ollnova’s contentions rely entirely on the inclusion of multiple sensors without any regard for how these are packaged, Ahmed satisfies Ollnova’s contentions—that is, in the event that Ollnova argues that Ahmed does not disclose a multi-sensor package, it should be noted that not only does Ahmed disclose a multi-sensor package explicitly, as required by the claim language, but these same disclosures also satisfy the broader position within Ollnova’s contentions which merely requires more than one kind of sensor within a device regardless of how these are packaged.

c. **1[b] a wireless communications component;**

156. Ahmed wireless automation components, as discussed in relation to the preamble of claim 1 of the ’282 patent, and thus these automation components satisfy the requirements of claim element 1[b] of including “a wireless communications component.”

157. Indeed, Ahmed discloses that each “sensor module,” “actuator module,” and “controller” include “a wireless communication device” (*see* Ahmed, Abstract). For example, in general, Ahmed discloses that the controller hubs, sensor modules, and actuator modules of the building control system therein each include local radio frequency communication capabilities, labeled “local RF Comm” in Ahmed FIG. 2, and discloses that “sensor module 204 includes a MEMS local RF communication circuit 210” (Ahmed, [0030]) as well as describing that these modules utilize “a short-range or local RF communication scheme such as Bluetooth” (Ahmed, [0028]).

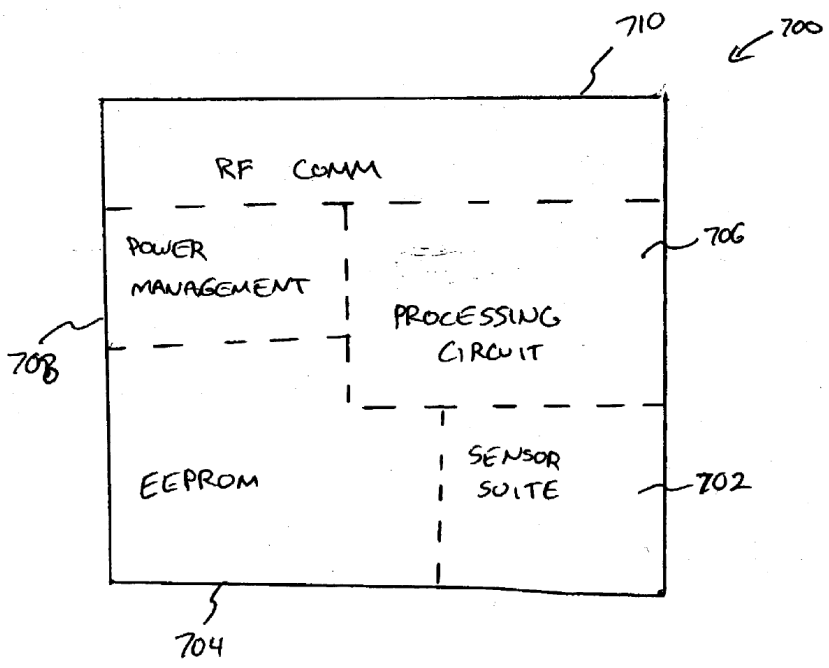


FIG. 7

Reproduction of Ahmed Figure 7.

158. More specifically, Figure 7 of Ahmed (reproduced above) shows "a block diagram of a module circuit" (Ahmed, [0019]) that includes "an RF communication circuit 710" (Ahmed, [0089]), and discloses that "[t]he RF communication circuit 710 is a MEMs based communication circuit … [and] is preferably configured to communicate using at least one local RF communication format, such as Bluetooth" (Ahmed, [0090]).

159. Therefore, for at least the reasons above, the modules of Ahmed include RF communication capabilities implemented via an RF communication circuit, and thus these modules include a wireless communication component as required by claim element 1[b]. Consequently, for at least the reasons above, it is my opinion that Ahmed discloses the requirements of claim element 1[b] of the '282 patent.

d. **1[c] a processor in communication with the wireless communications component and the sensor package;**

160. This claim element requires a processor that is in communication with the wireless communications component of claim element 1[b] and the sensor package of element claim 1[a]. For at least the following reasons, Ahmed discloses that the modules therein satisfy the requirements of claim element 1[c].

161. As detailed in relation to claim element 1[a] and 1[b], the modules of the space control subsystems of Ahmed each include a multi-sensor package and a wireless communications component. In addition, Ahmed discloses that a processor is also within each module and that this processor is in communication with the wireless communications component and the sensor package. For example, Ahmed discloses, in relation to an example sensor module 204, that "sensor module 204 includes a MEMS local RF communication circuit 210, a microcontroller 212, a programmable non-volative [*sic*] memory 214, a signal processing circuit 216, and one or more MEMS sensor devices 218" (Ahmed, [0030], emphasis added).

162. Similarly, in relation to Figure 7 therein—which, as discussed in relation to claim element 1[b], depicts a block diagram of an example module—each "module circuit 700 include[s] a sensor suite 702, an EEPROM 704, a processing circuit 706, a power management circuit 708 and an RF communication circuit 710" (Ahmed, [0089]), wherein "[t]he processing circuit 706 preferably incorporates a microprocessor or microcontroller, as well as microelectronics A/D circuits for connecting to the MEMs sensor devices of the sensor suite 702" (Ahmed, [0093]), "the signal processing circuit 706 otherwise controls the operations of the module" (Ahmed, [0093]), "[t]he signal processing circuit 706 obtains the programming instructions from the RF communication circuit 710 and stores the instructions into the EEPROM 704" (Ahmed, [0097]), and "the processing circuit 706 is configured to generate digital or analog outputs to a wide range of actuator

devices … [and] includes digital to analog and analog to digital conversion circuitry to allow both sensor input and actuator output" (Ahmed, [0099]).

163. Thus, Ahmed explicitly discloses that each module includes a processor within the processing circuit 706, and that this processor controls the operations of the module. Moreover, the processor obtains instructions from the RF communication circuit, and provides A/D conversion for sensor inputs—that is, the processor within processing circuit 706 is in communication with both the wireless communication component (RF communication circuit) and the sensors within the sensor suite (multi-sensor package). Consequently, for at least the reasons above, it is my opinion that Ahmed discloses the requirements of claim element 1[c] of the '282 patent.

164. In addition, I note that Ollnova's infringement contentions for claim element 1[c] do not address at all the requirement that a processor be "in communication with the wireless communications component and sensor package," and instead Ollnova merely identifies a processor within the accused ecobee thermostat devices. Therefore, to the extent that Ollnova argues that Ahmed does not disclose the requirements of claim element 1[c] due to some requirement associated with communication between the processor and the wireless communication component or sensor package, it should be noted that not only does Ahmed expressly describe a processor within the modules therein that both receives information from the RF communication circuit and processes sensor inputs, but also that Ollnova's own contentions merely require the presence of a processor within a device that has sensors. In other words, not only does Ahmed disclose the requirements of claim element 1[c] of the '282 patent, but it also satisfies Ollnova's own infringement contentions regarding this claim element.

e. **1[d] a memory in communication with the processor, the memory configured to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor; wherein the computer readable instructions are programmed to:**

165. Ahmed discloses that the modules therein include a memory in communication with the processor, and for at least the reasons below Ahmed discloses this memory being configured as required by claim element 1[d].

166. As shown in Figure 2 of Ahmed, each of the modules within a space control subsystem include a nonvolatile memory (labeled as "NV MEM") in the figure. Indeed, in reference to an example embodiment, Ahmed discloses that "sensor module 204 includes a MEMS local RF communication circuit 210, a microcontroller 212, a programmable non-volitive [*sic*] memory 214, a signal processing circuit 216, and one or more MEMS sensors devices 218" (Ahmed, [0030], emphasis added). Ahmed as discloses that programmable non-volatile memory 214 "may be embodied as a flash programmable EEPROM" (Ahmed, [0036]), and Figure 7 of Ahmed clearly depicts this EEPROM memory as part of the module circuitry alongside a processing circuit and sensor suite.

167. A POSITA would recognize that the EEPROM is utilized to store programing for execution by the processor, as well as information utilized by the processor, at least because embedded EEPROM memory is typically used in microprocessor systems for these purposes. In any event, Ahmed expressly discloses that the non-volatile memory of the modules is in communication with the processor by explaining, at length, that this memory contains configuration information that is utilized by the processor and that the processor can write into the memory (i.e., the memory is necessarily in communication with the processor). For example, Ahmed discloses that "[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform

operations in accordance with such configuration information" (Ahmed, [0039]). Accordingly, Ahmed discloses "a memory in communication with the processor" as required by claim element 1[d] of the '282 patent.

168. The storage of sensor data provided by the sensor package within the non-volatile memory of the modules is inherent in the sensor modules, since these modules convert the analog signals from embedded MEMS sensor devices into digital signals for RF transmission, which a POSITA would understand requires storage of the sensor data, at least temporarily, within a cache or other memory within the sensor module. More specifically, a POSITA would recognize that the flash EEPROM memory within a sensor module is a convenient memory in which to store sensor data after this has been derived from analog sensor data and before it has been transmitted by the RF communication system. Moreover, a POSITA would understand that such storage is required since there is no guarantee that a transmission will occur exactly when data is acquired and thus storage of the sensor data is necessary at least until it is transmitted. This is consistent with Ahmed's explicit disclosure that "[t]he EEPROM 704 also store information related to the function in which the module 600 will be used" (Ahmed, [0094]), since a POSITA would recognize that the function of a sensor module necessarily involves obtaining sensor data and this data will necessarily need to be stored between acquisition and transmission. Indeed, Ahmed discloses that "the microcontroller 212 determines whether it is time to transmit an updated temperature value to the hub module 202 … [t]he determination of when to transmit temperature values may be driven by a clock internal to the sensor module 204, or in response to a request or query received from the hub mobile 202, or both" (Ahmed, [0077]). Therefore, a POSITA would recognize that storage of temperature values between their acquisition and subsequent transmission is required. Furthermore, the storage of sensor data within a sensor is a standard practice which would be

expected by a POSITA as a normal feature in remote sensing devices required for their typical functionality.

169. In addition, Ahmed discloses that the non-volatile memory of the modules therein stored "computer readable instructions which are executable by the processor." Indeed, in general, the invention claimed within Ahmed contemplates space control subsystems utilizing multiple different sensor modules that "have the same physical construction" wherein different sensor modules contain different "configuration information" to determine which of the multiple sensors therein are used by a given sensor module and how each sensor module operates within the control subsystem (*see*, e.g., Ahmed, [0044]). More specifically, Ahmed discloses that "[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information" (Ahmed, [0039]). More specifically, in relation to the describing how a sensor module may be configured to be a temperature sensor by programming the configuration information, Ahmed discloses that "[t]he microcontroller 212, responsive to the configuration information, causes the signal processing circuit 216 to process signals only from the temperature sensor, ignoring output from other sensors of the sensor suite 218" (Ahmed, [0041]). Moreover, Ahmed explicitly discloses that the configuration within the memory includes code required for the processor to utilize the applicable sensors for a specific purpose, stating "in one embodiment of the invention, most or all of the code unique to the selected function of the module is downloaded into the EEPROM 704 during configuration of the device … [t]hus, if the module 600 is to operate as a temperature sensor module, then all appropriate code for a temperature sensor module is downloaded to the EEPROM

704" (Ahmed, [0096]). Thus, the configuration information stored within the memory includes instructions that are executed by the processor to determine how to operate the sensor module.

170. Consequently, for at least the reasons above, it is my opinion that Ahmed discloses the requirements of claim element 1[d] of the '282 patent.

171. In addition, I note that Ollnova's infringement contentions for claim element 1[d] do not address the requirement that a memory be "configured to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor," and instead Ollnova merely identifies that the ecobee accused products include memory. Therefore, to the extent that Ollnova argues that Ahmed does not disclose the requirements of claim element 1[c] due to some requirement associated with how the memory is configured or what information is stored therein, it should be noted that not only does Ahmed expressly describe a memory that satisfies the requirements of claim element 1[d], but also that Ollnova's own contentions merely require the presence of a memory. In other words, not only does Ahmed disclose the requirements of claim element 1[d] of the '282 patent, but it also satisfies Ollnova's own infringement contentions regarding this claim element.

f. **1[e] receive sensor control information related to sensor data in control at a second automation component in communication with the building automation system; and**

172. As an initial matter, I understand the Court has construed the term "receive sensor control information related to sensor data in control at a second automation component in communication with the building automation system" to mean "receive information that identifies which sensor or sensor value is driving or controlling a second automation component in communication with the building automation system." I have applied this construction throughout my analysis.

173. As detailed in relation to claim 1[d], Ahmed discloses "configuration information" that may be wirelessly received by a module within a space control subsystem to determine how the module functions. More broadly, also as detailed in relation to claim element 1[d], Ahmed contemplates a network of multiple modules, where each module is the same but may be configured to perform different functions using stored configuration information that determines, for example, which sensors are utilized and how the processor operates the module. *See* claim element 1[d]. More specifically, Ahmed discloses that each module therein "may readily be configured as any one of a large plurality of sensor types or even other types of building automation system components … reducing the per-unit tooling and design costs associated with ordinary building automation sensors … [i]t will be noted that the design of module 600 may not only be used as the sensor modules 204, 206 in exemplary space control subsystem 200 of FIG. 2, but may also be used as the hub module 202" (Ahmed, [0098]). Thus, Ahmed explicitly discloses automation components within a building automation system in which each component may be configured, using configuration information received by the component, to perform a given subset of its possible functions and to perform in various roles required by the building automation system.

174. More generally, in reference to a module, Ahmed discloses that "[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information" (Ahmed, [0039])—that is, Ahmed discloses that an automation component "receives" configuration information via its wireless communication device and that this received configuration information is stored in the memory and utilized by the processor to determine how to operate the automation component.

175. Further, the configuration information identifies "sensor or sensor value is driving or controlling a second automation component." More specifically, Ahmed discloses that the configuration information determines which sensor or sensors are required for an automation component's function, such as in relation to configuring a sensor module to operate as a temperature sensor as part of an HVAC system. Ahmed discloses "the EEPROM 704 may store information identifying that module 600 should enable its temperature sensing function as opposed to any of its other possible sensing functions" (Ahmed, [0094]).

176. In more detail, Ahmed discloses that the microprocessor within a sensor module uses the configuration information "to cause the appropriate sensor device or devices from the sensor device suite 218 to be operable connected to the signal processing circuit such that sensed signals from the appropriate sensor device are digitized and provided to the microcontroller 212 … the microcontroller 212 may also use the configuration information to format outgoing messages and/or control operation of the RF communication circuit 210" (Ahmed, [0039]). Moreover, in relation to the example embodiment where the sensor module is part of a HVAC control system, Ahmed discloses that "[t]he microcontroller 212, responsive to the configuration information, causes the signal processing circuit 216 to process signals only from the temperature sensor, ignoring output from other sensors of the sensor suite 218" (Ahmed, [0041]). Thus, Ahmed explicitly discloses that the configuration information, which is received by a module via the module's RF communication device, identifies the sensor or sensor values that the module should process and transmit.

177. Furthermore, Ahmed describes that the example space control system of Fig. 2 is a kind of HVAC system in which "sensor module 204 is configured to enable its temperature sensing function" (Ahmed, [0034]), "sensor module 206 is configured to operate as a flow sensor"

(Ahmed, [0044]), "actuator module 208 … is operable to control the position of a ventilation damper, thereby controlling the flow of heated or chilled air into the room" (Ahmed, [0045]), and "hub module 202 … performs the function of the loop controller (e.g., a PID controller) for the space control subsystem 110" (Ahmed, [0051]). Thus, Ahmed discloses an example embodiment of a space control system where a temperature sensor, flow sensor, and damper actuator are coordinated via a controller to perform HVAC operations.

178. Accordingly, a POSITA would understand that the temperature sensor provides the inside temperature to the hub, which then determine whether or not adjustments to the actuator are required to enforce programmed temperature settings. Indeed, Ahmed states that hub module 202 "obtains process variable values (i.e., sensor information) from either or both of the sensor modules 204 and 206 and generates control output values," "provides the control output values to the actuator module 208," and also "communicates with external elements of the building control system, for example the supervisory computer, fan or chiller control subsystems, and other room controller subsystems" (Ahmed, [0051], *see also* Ahmed, [0061]).

179. Therefore, at least because Ahmed explicitly contemplates the use of multiple similar modules which are configured to perform a particular role by configuration information programmed into each module memory, and because the sensor modules are connected to the supervisory computer via the hub modules, each sensor module receives configuration information from a hub module to cause it to function as required by the hub. More specifically, when configuring a space control subsystem of Ahmed for its purpose, the appropriate configuration information must be transmitted to each sensor module from the hub. Indeed, in addition to manual configuration, which a POSITA would understand could be achieved via the user interface provided by the supervisory computer that facilitates network management and coordination of

communication of data and control signals (Ahmed, [0105]), Ahmed discloses that the processing circuits of modules therein "may also include inherent memory that incorporates routines for self-commissioning, self-configuring and fault diagnostics for the module 600" (Ahmed, [0099]). Thus, Ahmed discloses that a module can self-configure, which a POSITA would understand involves, for example, a controller requisitioning required sensor modules for its assigned control processes via distributing corresponding configuration information.

180. Consequently, for at least the reasons above, the configuration information of Ahmed is received by sensor modules within space control subsystems from hub modules within the same building control system, and this configuration information is used by the sensor modules to identify which sensor values are required to be transmitted to the hub module. Accordingly, the modules of Ahmed "receive information that identifies which sensor or sensor value is driving or controlling a second automation component in communication with the building automation system," and it is my opinion that Ahmed discloses the requirements of claim element 1[e] of the '282 patent.

g. **1[f] communicate a portion of the stored sensor data corresponding to the received sensor control information to the second automation component.**

181. For at least the reasons detailed in relation to claim element 1[e], a sensor module of Ahmed (i.e., an example "automation component") communicates a portion of its stored data corresponding to the received sensor control information from a controller hub (i.e., an example "second automation component") within the same building automation system. More specifically, as detailed in relation to previous claim elements of claim 1, each sensor module within a space control subsystem of the building automation system of Ahmed receives "configuration information," which may be wirelessly transmitted to each sensor module from a controller hub; this configuration information is used by each sensor module to identify which of several different

kinds of available sensor data is needed by the hub for the hub's control processes, and the corresponding sensor data is transmitted to the controller hub.

182. Consequently, for at least the reasons above, it is my opinion that Ahmed discloses the requirements of claim element 1[f] of the '282 patent.

ii. Claim 6

183. Claim 6 of the '282 Patent recites:

> The automation component of claim 1, wherein all of the stored sensor data is communicated at a regular interval.

184. Claim 6 of the '282 depends upon claim 1 therein, and includes additional limitations pertaining to periodic transmission of all stored sensor data. For at least the reasons detailed above in relation to claim 1, it is my opinion that Ahmed discloses each and every limitation of claim 1 of the '282 patent; and, for at least the reasons below, it is my opinion that Ahmed also renders obvious the limitations added to this claim by claim 6.

185. Ahmed discloses periodic transmission of sensor data from sensor modules, such as, "[t]he microcontroller 212 may cause the transmission of sensor data from time-to-time as dictated by an internal counter or clock" (Ahmed, [0038]); and "[n]ew sensor and/or setpoint values may be received periodically either on a schedule, or in response to requests generated by the processor 272" (Ahmed, [0075]).

186. Ahmed discloses that configuration information determine which sensor data is transmitted from each sensor module (*see* claim 1), and a POSITA would recognize that configuration such that all of the stored sensor data is transmitted is merely an application-specific design choice. For instance, if the sensor module included temperature, humidity, and occupancy sensors it would be obvious to a POSITA that all of the sensor data may be utilized by an HVAC system such that, for example, room temperature could be controlled based on humidity and occupancy (e.g., lower

temperatures may be desirable for higher humidity temperatures to optimize comfort, and different comfort or zoning considerations may be applied based on which rooms are occupied).

187. Consequently, for at least the reasons above, it is my opinion that claim 6 of the ’282 patent is obvious to a POSITA in view of Ahmed.

D. Claims 1 and 6 of the ‘282 Patent are anticipated or obvious to a POSITA in view of McFarland

i. Claim 1

188. Claim 1 of the ’282 Patent recites:

> An automation component configured for wireless communication within a building automation system, the automation component comprising:
>
> a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable;
>
> a wireless communications component;
>
> a processor in communication with the wireless communications component and the sensor package;
>
> a memory in communication with the processor, the memory configured to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor; wherein the computer readable instructions are programmed to:
>
> receive sensor control information related to sensor data in control at a second automation component in communication with the building automation system; and
>
> communicate a portion of the stored sensor data corresponding to the received sensor control information to the second automation component.

189. Thus, claim 1 of the ’282 patent is directed towards a wireless automation component within a building automation system, and includes limitations pertaining to selective communication of sensor data between different automation components within the building

automation system. For at least the reasons detailed below, each and every limitation of claim 1 of the ’282 patent is disclosed by McFarland, and, consequently, this claim is invalid as anticipated or obvious to a POSITA in view of McFarland.

190. In my analysis below I describe features that are disclosed in the text of McFarland itself, but I also disclose features that are disclosed in the Ahmed ’849 reference. As noted above, the disclosure of Ahmed ’849 was incorporated in its entirety into McFarland, and thus forms part of McFarland’s disclosure to a POSITA (McFarland, [0004]). To be clear, while I refer to each disclosure separately for purposes of identifying where claim elements can be found in the respective disclosures, both disclosures together form the disclosure of McFarland, and therefore each disclosure below is a disclosure of the McFarland reference.

a. **1[pre] An automation component configured for wireless communication within a building automation system, the automation component comprising**

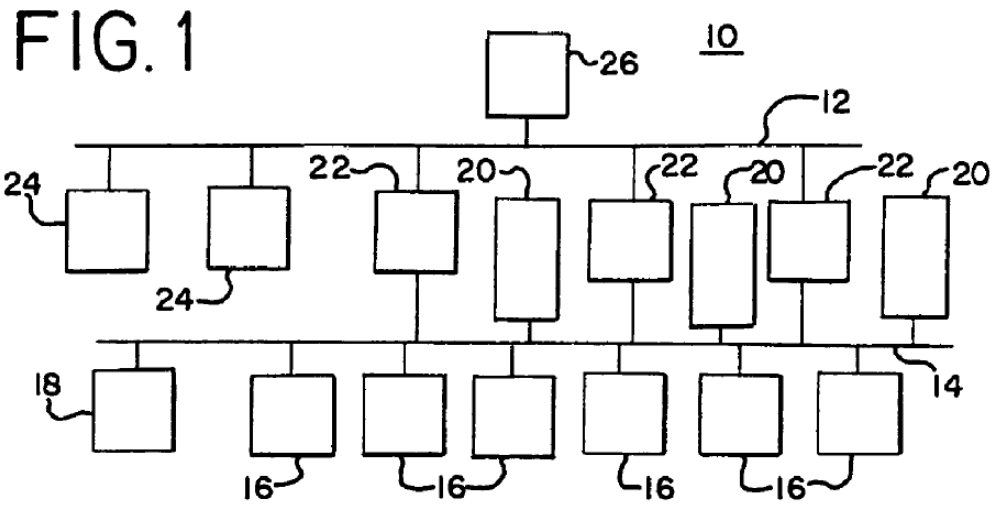
191. To the extent that the preamble of claim 1 of the ’282 patent is limiting, McFarland discloses an automation component configured for wireless communication within a building automation system.

192. McFarland discloses a system comprising a “lower level network” and a “high level network” comprising wireless communications networks (McFarland, [0028]), which includes components configured for wireless communication equipped to control building automation. With respect to Figure 1, McFarland states “[o]ne of the wireless networks 12 is a high level control network, and the other wireless network 14 is a lower level operations network.” More specifically, McFarland discloses, with respect to Figure 1 shown therein, a block diagram of a multi-tier wireless building automation control system architecture (McFarland, [0019]), including sensor arrangements (16) configured for communication with actuator arrangements (20), and

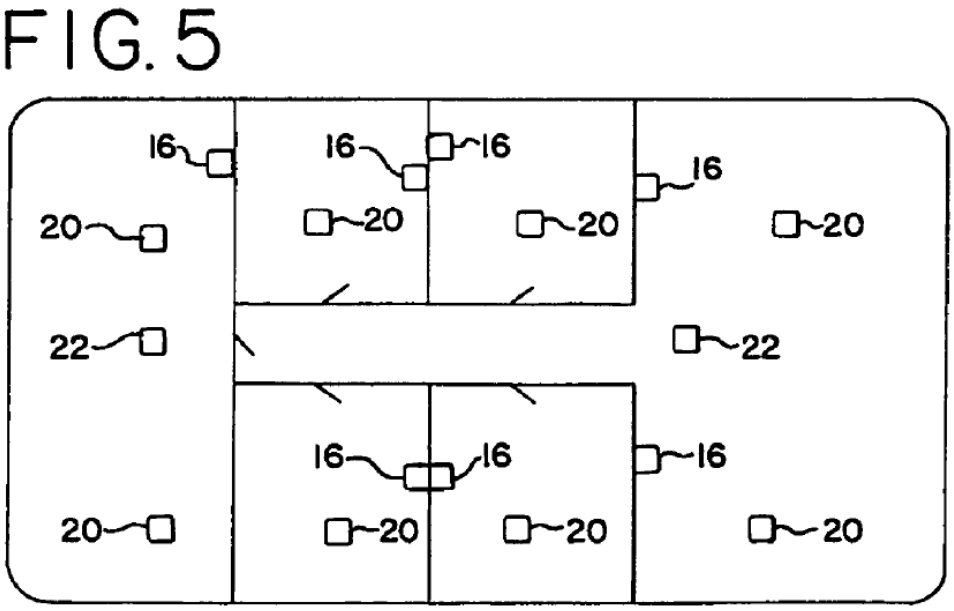
controller (22), each of which constitute wireless automation components configured for wireless communication within a building automation system. (*see*, e.g., McFarland, Abstract, [0002]-[0004], [0006], [0010], [0026]). McFarland states in its Abstract, for example, that "[o]n a first level of the wireless building automation architecture, sensors and associated actuators communicate directly," where "[t]he sensor performs control processes appropriate for the sensor and regardless of the type of actuator being used," and "[t]he actuator performs control processes specific to the actuator regardless of the type of sensor being used" (McFarland at Abstract). In particular, McFarland explains

> [t]he sensor reports information appropriate or specific to the sensor, such as reporting the result of a comparison of a measured value to a desired or set point value. Actuators use the output sensor data to provide a response appropriate for the actuator. Controllers monitor the process or action of sensors and actuators without control in one mode of operation. In another mode of operation, the controllers override the sensor and/or actuators to alter processing based on a regional or larger area control process (McFarland, [0031], see also, e.g., [0050]-[0054]; [0056]-[0057]).

193. Figure 1 and Figure 5 of McFarland, reproduced below, illustrate exemplary arrangements of automation components of the disclosed system in a building automation system.

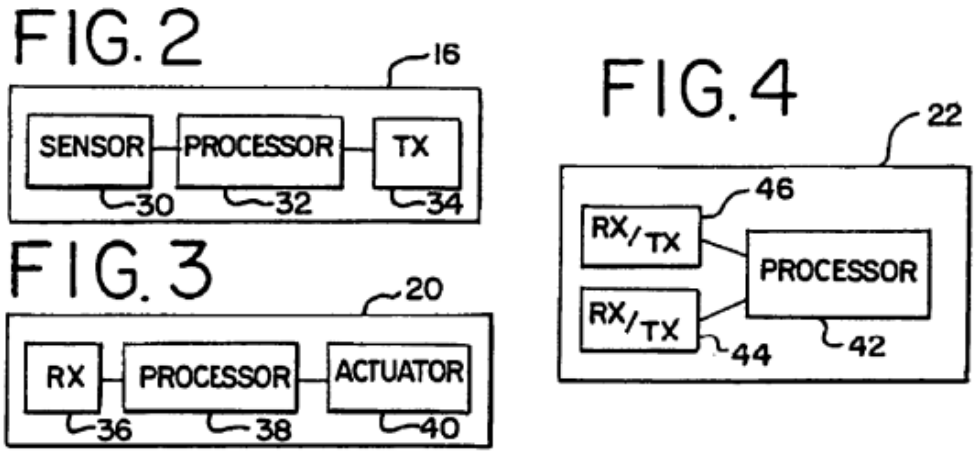


Reproduction of McFarland figure 1.



Reproduction of McFarland figure 5.

194. Figures 2, 3, and 4 of McFarland shows block diagrams of exemplary automation components (sensor arrangement, actuator arrangement, controller) that wirelessly communicate and operate within its disclosed system:



Reproduction of McFarland figures 2, 3 and 4.

195. McFarland discloses that such sensor, actuators, and controllers may each include processors as well as transceivers for transmitting and/or receiving wireless communications signals. For example, McFarland explains that sensor arrangement 16 "includes a sensor 30, a sensor processor 32 and a transmitter 34," where "transmitter 34 is a radio frequency transmitter"

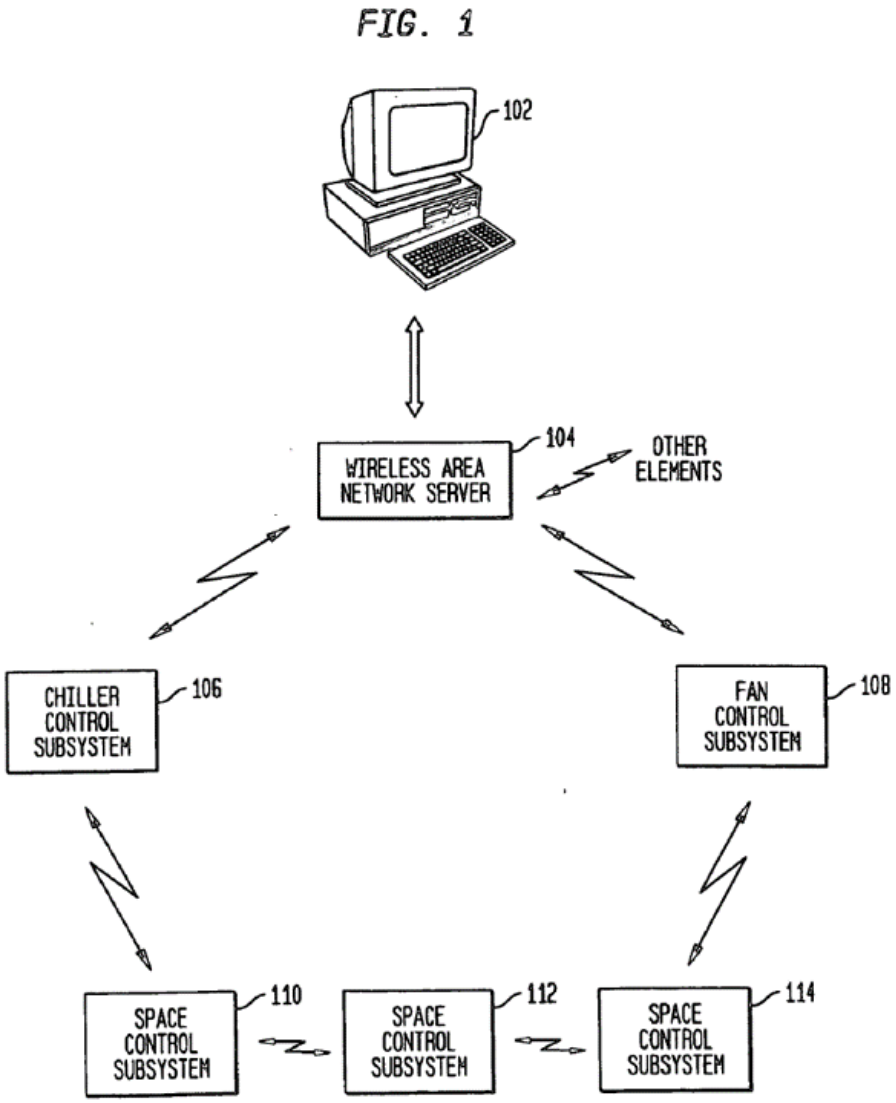
(McFarland, [0034], [0037]). McFarland further explains that actuator arrangement 20 "includes a receiver 36, an actuator processor 38 and an actuator 40," where "receiver 36 is a radio frequency receiver" (McFarland, [0038]-[0039]). McFarland further explains that controller 22 "include one or more processors 42 and two transceivers 44, 46," where "[o]ne transceiver 44 is operable for connecting with the lower level network 14," and "transceiver 46 is operable to transmit and receive information to and from other controllers 22, or other devices 24 and 26 of the high level wireless network 12" (McFarland, [0052]-[0054]).

196. McFarland discloses that "in one embodiment, sensor arrangements 16, other devices 18 and/or the actuator arrangements 20 operate as full function devices of 802.15.4 allowing for dynamically assigned communications with different devices over a single or multiple communications path but without the ability to route routing communications from other devices" (McFarland, [0033]). McFarland further explains that "transmissions addressed to other devices, such as one or more of the controllers 22 are also transmitted," where "receiving controller 22 then routes the signals to the desired or addressed controller 22" (*Id*.). McFarland further states that "[c]ontrollers associated with the sensors and actuators perform the automation without a separate controller for managing or providing control instructions for the building automation or environment function" (McFarland, [0067]; *see also* McFarland [0076-0077]).

197. Thus, for at least the reasons detailed above, to the extent the preamble is limiting, McFarland discloses "[a]n automation component configured for wireless communication within a building automation system." Further, for at least the reasons detailed in relation to Section VI.C.a, Ahmed satisfies this claim element; and, because McFarland incorporates Ahmed '849 by reference, which has the same or substantially the same disclosure as Ahmed, as discussed in Section V.B, for at least the same reasons McFarland also satisfies claim element 1[pre].

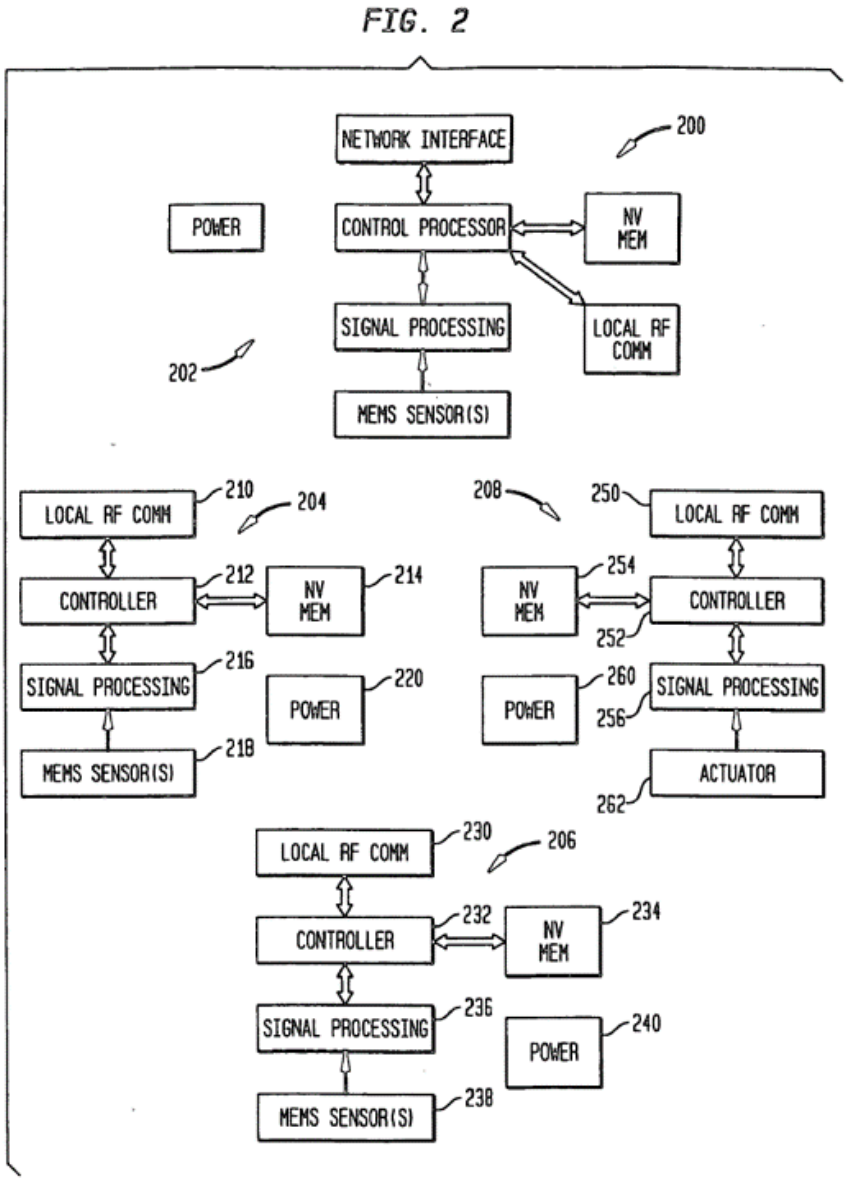
198. For example, Ahmed ’849 discloses a wireless network of automation components within a building. The abstract of Ahmed ’849 describes “[a]n apparatus for use in a building system includes at least one microelectromechanical (MEMS) sensor device and a processing circuit that are integrated onto a single substrate,” wherein “at least one MEMs sensor device is operable to generate a process value … [t]he processing circuit is operable convert the process value to an output digital signal configured to be communicated to another element of a building automation system … [and] [t]he building automation system includes one or more devices that are operable to generate a control output based on set point information and process value information from one or more sensors” (Ahmed ’849, Abstract).

199. Ahmed ’849 discloses equivalent material compared to Ahmed. In particular, Ahmed ’849 also discloses the same block diagrams that are disclosed in Ahmed, as Figure 1 and Figure 2, reproduced below.



Reproduction of Ahmed '849 Figure 1.

200. Figure 1 of Ahmed '849 shows a block diagram of an exemplary building control system in which a supervisory computer is communicatively coupled to building subsystems via a wireless area network.



Reproduction of Ahmed '849 Figure 2.

201. Figure 2 of Ahmed '849 shows a "block diagram of an exemplary room control system that may be used as the space control subsystems 110" (Ahmed '849, [0038]), depicted in Figure 1. Each space control subsystem includes a "hub module 202," two "sensor modules 204 and 206," and one "actuator module 208" (Ahmed '849, [0029]). In an example embodiment discussed within Ahmed '849, the room control system of figure 2 is configured to control HVAC equipment whereby "[t]he first sensor module 204 represents a temperature sensor module and is preferably

embodied as a wireless integrated network sensor" (Ahmed '849, [0039]), "[t]he sensor module 206 is configured to operate as a flow sensor" (Ahmed '849, [0052]), and "[t]he actuator module 208 … is operable to control the position of a ventilation damper, thereby controlling the flow of heated or chilled air into the room" (Ahmed '849, [0053]).

202. Thus, each of modules 202, 204, 208, and 206 constitutes example "automation components" as required by claim 1 of the '282 patent. Moreover, the hub module 202 including a "network interface" to communicate with other hub devices as well as "local RF comm" to wirelessly communicate with other modules. The modules 204, 208, and 206 also include "local RF comm" to allow wireless communication between modules. Additionally, Ahmed '849 describes these modules as constituting parts of a building control system which function to autonomously control the environment within "spaces" or "rooms" in a building. Therefore, Ahmed '849 discloses automation components that are configured for wireless communication within a building automation system.

203. Consequently, for at least the reasons above, to the extent that the preamble of claim 1 of the '282 patent is limiting, it is my opinion that McFarland and Ahmed '849 (incorporated into McFarland) disclose the requirements of this preamble.

204. In addition, regarding the claim term "[first/second] automation component," to the extent that this term applies to the "an automation component" of the claim 1 preamble I have applied the Court's construction for this term in forming my opinions. More specifically, the Court has ordered that the term "[first/second] automation component" be construed to mean "[first/second] component designed to operate without human interaction in an automation system" and I have applied this construction in my analysis. The components and modules of McFarland and Ahmed '849 are used within a building control system to autonomously control the environment within a

room of the building by operating actuator modules based on information from sensor modules, and thus operate without human interaction when performing their usual function. In any event, both McFarland and Ahmed '849 disclose a control subsystem consisting of temperature sensors, actuators, and controllers for controlling HVAC equipment—i.e., they disclose autonomous components consistent with my understanding of Ollnova's accusations, which purport that a thermostat controller and/or associated remote temperature sensors are allegedly automation components that satisfy claim 1 of the '282 patent. In other words, in the event that Ollnova argues that McFarland or Ahmed '849 do not disclose the claimed autonomous components as construed by the Court, it should be noted that not only does McFarland and Ahmed '849 disclose automation components according to the Court's construction, but these disclosures also satisfy Ollnova's own infringement theories as I understand them.

b. **1[a] a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable;**

205. McFarland discloses wireless automation components that include a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable, for at least the following reasons.

206. As discussed in relation to the preamble of claim 1, McFarland discloses a wireless building control system comprised of multiple "sensor arrangements" networked together; where each sensor arrangement can wirelessly communicate to other wireless communication components (e.g., actuator arrangements and controllers) within the local subsystem; and where each such component constitutes an automation component of claim 1 of the '282 patent.

207. McFarland explains that the disclosed sensor arrangement is "configured to detect a plurality of variables, and generate sensor data for each variable," as required by claim element 1[a], where the sensor data is wirelessly communicated to and used by, for example, actuators to

control building components. For example, McFarland states "[t]he sensor performs control processes appropriate for the sensor and regardless of the type of actuator being used, and the output from the sensor is wirelessly communicated to an actuator" (McFarland, [0006]). McFarland also states "[a]ctuators use the output sensor data to provide a response appropriate for the actuator. Controllers monitor the process or action of sensors and actuators without control in one mode of operation" (McFarland, [0027]). Additionally, McFarland also provides embodiments wherein "the higher level wireless network 12 and controllers 22 are operable to instruct redirection of data, such as sensor data from the sensor arrangement 16 to the higher level wireless network 12" (McFarland, [0060]).

208. McFarland also discloses that sensor modules can comprise multiple different sensors, each for sensing different variables, packed together into a sensor suite. More specifically, in reference to sensor arrangement 16, McFarland discloses that "sensor 30 is a temperature sensor, humidity sensor, fire sensor, smoke sensor, occupancy sensor, air quality sensor, gas sensor, CO_2 or CO sensor or other now known or later developed sensors, such as an oxygen sensor for use in hospitals," where "[m]icro-electro-mechanical sensors or larger sensors for sensing any environmental condition may be used." (McFarland, [0035]). Notably, McFarland further states that "[i]n one embodiment, the sensor 30 includes a suit [*sic*] of sensors for sensing multiple environmental conditions" (*Id*., emphasis added).

209. Consequently, for at least the reasons above, it is my opinion that McFarland discloses the requirements of claim element 1[a] of the '282 patent. Further, for at least the reasons detailed in relation to Section VI.C.b, Ahmed satisfies this claim element; and, because McFarland incorporates Ahmed '849 by reference, which has the same or substantially the same disclosure as

Ahmed, as discussed in Section V.B, for at least the same reasons McFarland also satisfies claim element 1[a].

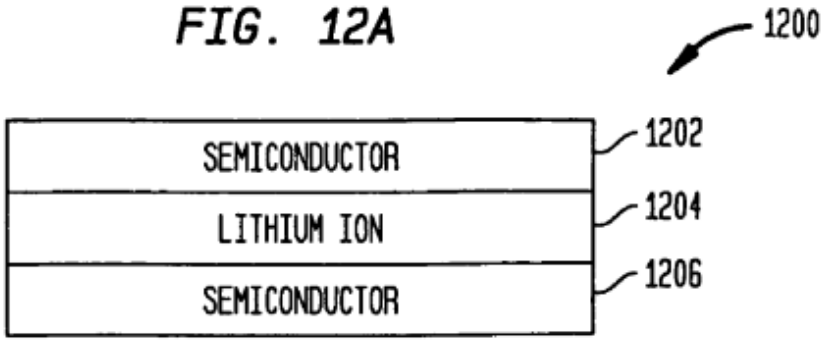
210. Ahmed ’849 discloses wireless automation components that include a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable, for at least the following reasons.

211. As discussed in relation to the preamble of claim 1, Ahmed ’849 discloses a wireless building control system comprised of multiple “space control subsystems” networked together; where each space control subsystem is comprised of a hub that can wirelessly communicate to other subsystems as well as sensor modules and actuator modules within the local subsystem; and where each hub and module constitute an automation component of claim 1 of the ’282 patent.

212. Ahmed ’849 also discloses that sensor modules can comprise multiple different sensors, each for sensing different variables, packed together into a sensor suite. More specifically, in reference to MEMS sensor module 218 within an example sensor module, Ahmed ’849 discloses that “[t]he MEMS sensor device(s) 218 include at least one MEMS sensor, which may suitably by a temperature sensor, flow sensor, pressure sensor and/or gas-specific sensor. … In a preferred embodiment, several sensors are incorporated into a single device as a sensor suite 218” (Ahmed ’849, [0042], emphasis added).

213. Ahmed ’849 provides yet further details, disclosing that the several different sensors within a sensor suite may be fabricated onto a single semiconductor substrate. For instance, figure 12A (reproduced below), shows “a representative side view of a control system module according to an aspect of the invention” (Ahmed ’849, [0031]) that is an example “a single, self-powered, standalone device in which most of the active components are integrated onto one or two semiconductor substrates” (Ahmed ’849, [0102]-[0103]). Ahmed ’849 states “[t]he sensor

suite 1252 is collection of MEMS sensors incorporated into a single substrate. The incorporation of multiple MEMS sensor technologies is known" (Ahmed '849, [0107]). With respect to this design, Ahmed '849 further explains that "the processing circuit 1256 performs the operations described above in connection with the signal processing circuit 216 and controller 212 of the sensor module 204 of FIG. 2" (Ahmed '849, [0108]).



Reproduction of Ahmed '849 figure 12A.

214. At least because Ahmed '849 discloses a sensor suite, including incorporating several MEMS sensors on the same semiconductor substrate and packaging this within a single sensor module, Ahmed '849 discloses "a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detector variable." Indeed, a POSITA would recognize that integration of different sensors within a single substrate necessitates that these different sensors are packaged together, since otherwise the packaging would necessarily divide the semiconductor material into more than one substrate. Consequently, for at least the reasons above, it is my opinion that Ahmed '849 discloses the requirements of claim element 1[a] of the '282 patent.

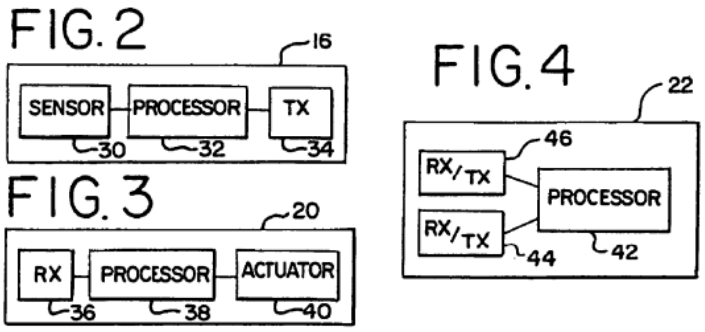
215. In addition to satisfying the requirements of the claim language as these would be understood by a POSITA, I understand that McFarland and Ahmed '849 also satisfies the position within Ollnova's infringement contentions pertaining to claim element 1[a] of the '282 patent. More specifically, I understand that Ollnova's contentions do not address the packaging of

multiple sensors at all, and instead contend that each ecobee thermostat comprises a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detector variable merely because ecobee thermostats include temperature, humidity, occupancy, and/or proximity sensors. As discussed above, McFarland and Ahmed '849 explicitly discloses that the modules therein include several different sensors, and to the extent that Ollnova relies on the inclusion of multiple sensors, McFarland and Ahmed '849 satisfies Ollnova's contentions—that is, in the event that Ollnova argues that McFarland and Ahmed '849 do not disclose a multi-sensor package, it should be noted that not only do McFarland and Ahmed '849 disclose a multi-sensor package explicitly, as required by the claim language, but these same disclosures also satisfy the broader position within Ollnova's contentions which merely requires more than one kind of sensor within a device regardless of how these are packaged.

c. **1[b] a wireless communications component;**

216. McFarland discloses wireless automation components, as discussed in relation to the preamble of claim 1 of the '282 patent, and thus these automation components satisfy the requirements of claim element 1[b] of including "a wireless communications component."

217. McFarland discloses a "Wireless Building Control Architecture," and states in its Abstract, for example, that "[o]n a first level of the wireless building automation architecture, sensors and associated actuators communicate directly," where "[t]he sensor performs control processes appropriate for the sensor and regardless of the type of actuator being used," and "[t]he actuator performs control processes specific to the actuator regardless of the type of sensor being used." In Figures 2, 3, and 4, McFarland also provides block diagrams of exemplary automation components (sensor arrangement, actuator arrangement, controller) that wirelessly communicate and operate within its disclosed system:



Reproduction of McFarland Figures 2, 3 and 4.

218. For example, McFarland states that sensor arrangement 16 "includes a sensor 30, a sensor processor 32 and a transmitter 34," where "transmitter 34 is a radio frequency transmitter" (McFarland, [0034], [0037]). McFarland further explains that actuator arrangement 20 "includes a receiver 36, an actuator processor 38 and an actuator 40," where "receiver 36 is a radio frequency receiver" (McFarland, [0038]-[0039]). McFarland additionally explains that controller 22 "include one or more processors 42 and two transceivers 44, 46," where "[o]ne transceiver 44 is operable for connecting with the lower level network 14," and "transceiver 46 is operable to transmit and receive information to and from other controllers 22, or other devices 24 and 26 of the high level wireless network 12." (McFarland, [0052]-[0054]).

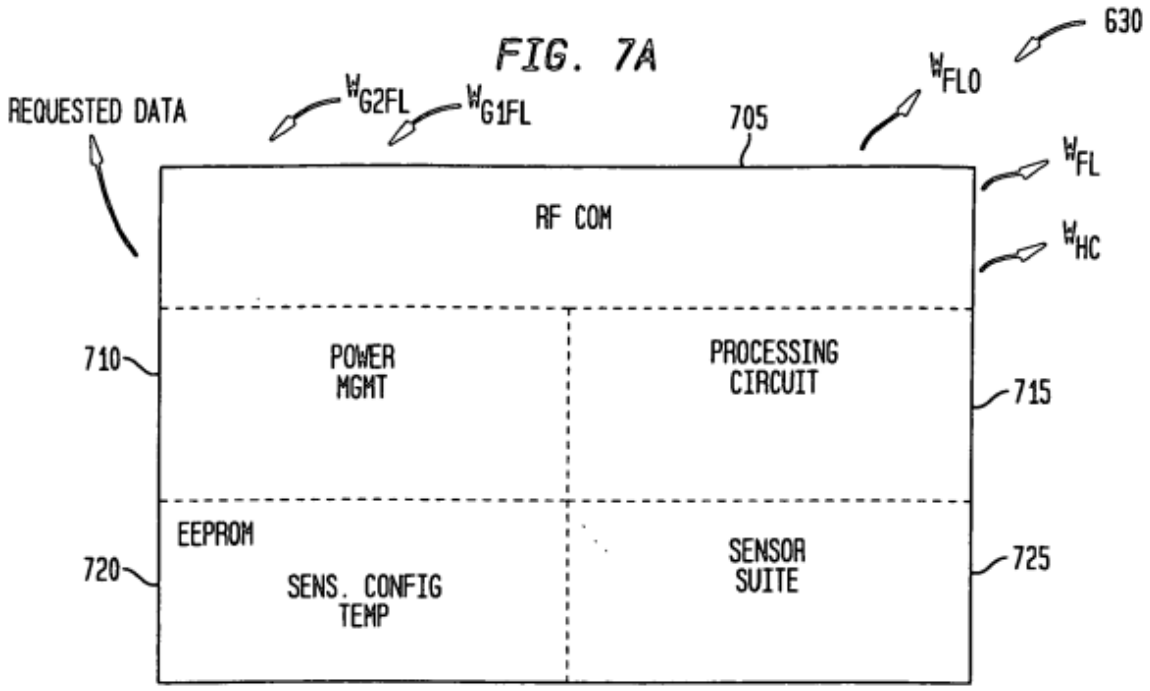
219. Therefore, for at least the reasons above, the components of McFarland wireless communication capabilities, and thus these modules include a wireless communication component as required by claim element 1[b]. Consequently, for at least the reasons above, it is my opinion that McFarland discloses the requirements of claim element 1[b] of the '282 patent.

220. Further, for at least the reasons detailed in relation to Section VI.C.c, Ahmed '849 satisfies this claim element; and, because McFarland incorporates Ahmed '849 by reference, which has the same or substantially the same disclosure as Ahmed, as discussed in Section V.B, for at least the same reasons McFarland also satisfies claim element 1[b].

221. For example, Ahmed ’849 discloses wireless automation components, as discussed in relation to the preamble of claim 1 of the ’282 patent, and thus these automation components satisfy the requirements of claim element 1[b] of including “a wireless communications component.”

222. Indeed, Ahmed ’849 discloses that each “sensor module,” “actuator module,” and “hub module” controller include “a wireless communication device” (*see* Ahmed ’849, [0038], [0040], [0047], [0048], [0054], Fig. 7a). For example, in general, Ahmed ’849 discloses that the controller hubs, sensor modules, and actuator modules of a space control subsystem each include local radio frequency communication capabilities, labeled “local RF Comm” in Ahmed ’849 FIG. 2, and discloses that “sensor module 204 includes a MEMS local RF communication circuit 210” (Ahmed ’849, [0040]) as well as describing that these modules utilize “a short-range or local RF communication scheme such as Bluetooth” (Ahmed ’849, [0038]).

223. More specifically, Figure 7a of Ahmed ’849 (reproduced below) shows “a block diagram of a control module” (Ahmed ’849, [0020]) that includes “an RF communication circuit 705” (Ahmed ’849, [0117]; see also [0105]).



Reproduction of Ahmed '849 Figure 7a.

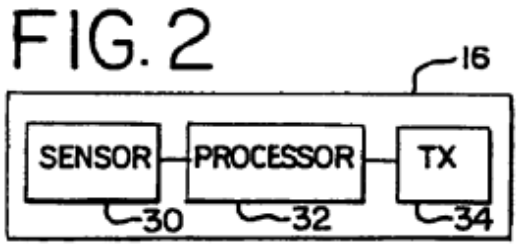
224. Therefore, for at least the reasons above, the modules of Ahmed '849 include RF communication capabilities implemented via an RF communication circuit, and thus these modules include a wireless communication component as required by claim element 1[b]. Consequently, for at least the reasons above, it is my opinion that Ahmed '849 discloses the requirements of claim element 1[b] of the '282 patent.

d. **1[c] a processor in communication with the wireless communications component and the sensor package;**

225. Claim element 1[c] of the '282 patent requires a processor that is in communication with the wireless communications component of claim element 1[b] and the sensor package of element claim 1[a].

226. For at least the following reasons, McFarland discloses that the modules therein satisfy the requirements of claim element 1[c].

227. As detailed in relation to claim element 1[a] and 1[b], the sensor arrangement components of the automated building control systems of McFarland each include a multi-sensor package and a wireless communications component. In addition, McFarland discloses that a processor is also within each module and that this processor is in communication with the wireless communications component and the sensor package.



Reproduction of McFarland figure 2.

228. For example, McFarland discloses, in relation to an example sensor arrangement 16, that "[t]he sensor arrangement 16 includes a sensor 30, a sensor processor 32 and a transmitter 34" (McFarland, [0034], emphasis added). McFarland discloses a similar explanation in other portions of its disclosure, where it states "[a] sensor arrangement includes a sensor, a sensor processor and a radio frequency transmitter" (McFarland, [0011], emphasis added). McFarland further explains that "[t]he sensor performs control processes appropriate for the sensor and regardless of the type of actuator being used, and the output from the sensor is wirelessly communicated to an actuator" (McFarland, [0006], emphasis added).

229. Similarly, in relation to Figure 2 of McFarland—which, as discussed in relation to claim element 1[b], depicts a block diagram of an example sensor arrangement—McFarland states that "[t]he processor 32 is a general processor, digital signal processor, control processor, application specific integrated circuit, field programmable gate array, analog circuit, digital circuit, combinations thereof or other now known or later developed device for implementing a control process on a signal measured by the sensor 30," where "[t]he processor 32 has a processing power

or capability and associated memory corresponding to the specific sensor 30 or corresponding to the needs of one of a plurality of different types of sensors 30 with a maximum desired processing power, such as an 8 or 16 bit processor" (McFarland, [0036]).

230. McFarland further explains that "[t]he transmitter 34 is responsive to the processor 32 or other logic for increasing or decreasing transmitted power," or, "[a]lternatively, a set transmit power is used," and that "[t]he transmitter 34 is responsive to the processor 32 or other logic for changing a frequency, data format, interference avoidance technique or other transmission or reception property either automatically or in response to control signals" (McFarland, [0037]).

231. Thus, McFarland explicitly discloses that each sensor arrangement includes a processor that controls the operations of the module, and that the processor is in communication with both the wireless communication component and the sensors within the sensor suite (multi-sensor package). Consequently, for at least the reasons above, it is my opinion that McFarland discloses the requirements of claim element 1[c] of the '282 patent.

232. Further, for at least the reasons detailed in relation to Section VI.C.d, Ahmed satisfies this claim element; and, because McFarland incorporates Ahmed '849 by reference, which has the same or substantially the same disclosure as Ahmed, as discussed in Section V.B, for at least the same reasons McFarland also satisfies claim element 1[c].

233. As detailed above in relation to claim element 1[a] and 1[b], the modules of the space control subsystems of Ahmed '849 each include a multi-sensor package and a wireless communications component. In addition, Ahmed '849 discloses that a processor is also within each module and that this processor is in communication with the wireless communications component and the sensor package. For example, Ahmed '849 discloses, in relation to an example sensor module 204, that "sensor module 204 includes a MEMS local RF communication circuit

210, a microcontroller 212, a programmable non-volative [*sic*] memory 214, a signal processing circuit 216, and one or more MEMS sensor devices 218" (Ahmed '849, [0040], emphasis added).

234. Similarly, in relation to Figure 7a of McFarland—which, as discussed in relation to claim element 1[b], depicts a block diagram of an example module—each "control module 630 includes an RF communication circuit 705, a power management circuit 710, a processing circuit 715, an EEPROM 720, and a sensor suite 725" (Ahmed '849, [0117]), wherein "[t]he processing circuit 1256 incorporates a microprocessor or microcontroller, as well as microelectronics A/D circuits for connecting to the MEMS sensor devices of the sensor suite 1252" (Ahmed '849, [0108]), where "processing circuit 1256 performs the operations described above in connection with the signal processing circuit 216 and controller 212 of the sensor module 204 of FIG. 2" (Ahmed '849, [0108]), and "processing circuit 1256 obtains the programming instructions from the RF communication circuit 1260 and stores the instructions into the EEPROM 1254" (Ahmed '849, [0112]).

235. Thus, Ahmed '849 explicitly discloses that each module includes a processor within the processing circuit, and that this processor controls the operations of the module. Moreover, the processor obtains instructions from the RF communication circuit, and provides A/D conversion for sensor inputs—that is, the processor within processing circuit is in communication with both the wireless communication component (RF communication circuit) and the sensors within the sensor suite (multi-sensor package). Consequently, for at least the reasons above, it is my opinion that Ahmed '849 discloses the requirements of claim element 1[c] of the '282 patent.

236. In addition, I understand that Ollnova's infringement contentions for claim element 1[c] do not address at all the requirement that a processor be "in communication with the wireless communications component and sensor package," and instead Ollnova merely identifies a

processor within the accused ecobee thermostat devices. Therefore, to the extent that Ollnova argues that McFarland or Ahmed '849 does not disclose the requirements of claim element 1[c] due to some requirement associated with communication between the processor and the wireless communication component or sensor package, it should be noted that not only does McFarland and Ahmed '849 expressly describe a processor within the modules therein that both receives information from the RF communication circuit and processes sensor inputs, but also that Ollnova's own contentions merely require the presence of a processor within a device that has sensors. In other words, not only do McFarland and Ahmed '849 disclose the requirements of claim element 1[c] of the '282 patent, but they also satisfy Ollnova's own infringement contentions regarding this claim element as I understand them.

e. **1[d] a memory in communication with the processor, the memory configured to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor; wherein the computer readable instructions are programmed to:**

237. McFarland discloses that the modules therein include a memory in communication with the processor, and for at least the reasons below McFarland discloses this memory being configured as required by claim element 1[d].

238. As shown, for example, in Figure 2 of McFarland, each sensor arrangement component includes a processor in communication with a sensor suite and a transmitter. McFarland further states that "[t]he sensor performs control processes appropriate for the sensor and regardless of the type of actuator being used, and the output from the sensor is wirelessly communicated to an actuator" (McFarland, [0006], emphasis added).

239. Similarly, in relation to Figure 2 therein, McFarland states that "[t]he processor 32 is a general processor, digital signal processor, control processor, application specific integrated circuit, field programmable gate array, analog circuit, digital circuit, combinations thereof or other

now known or later developed device for implementing a control process on a signal measured by the sensor 30," where "[t]he processor 32 has a processing power or capability and associated memory corresponding to the specific sensor 30 or corresponding to the needs of one of a plurality of different types of sensors 30 with a maximum desired processing power, such as an 8 or 16 bit processor" (McFarland, [0036], emphasis added). McFarland further states that "[b]y minimizing the processor requirements and associated memory, the cost of the sensor arrangement 16 may be reduced," where "[t]he processor 32 implements a control process algorithm specific to the sensor arrangement 16" (*Id*., emphasis added).

240. McFarland further explains that "[f]or example, a control algorithm is distributed on both a sensor processor 32 and an actuator processor 38 for performing a single or multiple functions," where "[t]he portion of the control algorithm corresponding to a specific device 16, 18, 20 is then operated or implemented at the specific device without the need of further control" (McFarland, [0043]). In this regard, "[t]he control algorithm for the temperature function with in [*sic*] the room is distributed on the different sensor arrangement 16 and actuator arrangements 20," and "[t]he sensor arrangement 16 in this corresponding control algorithm outputs information specific to the sensing function without information indicating an act to be performed" (McFarland, [0043]).

241. A POSITA would recognize that the disclosed memory is utilized to store computer-readable instructions (e.g., the "control algorithm") for execution by the processor, as well as information utilized by the processor, at least because embedded memory is typically used in microprocessor systems for these purposes. In any event, McFarland expressly discloses that the memory of the sensor arrangement is in communication with the processor by explaining, at length, that this memory contains configuration information that is utilized by the processor, and the processor implements the disclosed functions of the disclosed system, including the processing

of received information and the storage and transmission of sensor data. Accordingly, McFarland discloses "a memory in communication with the processor" as required by claim element 1[d] of the '282 patent.

242. Further, the storage of sensor data provided by the sensor package within the memory of the modules is inherent in the sensor modules, since these modules measure temperature and convert the signals for transmission (*see* McFarland, [0068]), which a POSITA would understand requires storage of the sensor data, at least temporarily, within a cache or other memory within the sensor module. More specifically, a POSITA would recognize that the disclosed memory within a sensor module is a convenient memory in which to store sensor data after this has been derived from analog sensor data and before it has been transmitted by the communication system. Moreover, a POSITA would understand that such storage is required since there is no guarantee that a transmission will occur exactly when data is acquired and thus storage of the sensor data is necessary at least until it is transmitted. This is consistent with McFarland's disclosure, since a POSITA would recognize that the function of a sensor module necessarily involves obtaining sensor data and this data will necessarily need to be stored between acquisition and transmission. Therefore, a POSITA would recognize that storage of temperature values between their acquisition and subsequent transmission is required. Furthermore, the storage of sensor data within a sensor is a standard practice which would be expected by a POSITA as a normal feature in remote sensing devices required for their typical functionality.

243. Consequently, for at least the reasons above, it is my opinion that McFarland discloses the requirements of claim element 1[d] of the '282 patent. Furthermore, for at least the reasons detailed in relation to Section VI.C.e, Ahmed satisfies this claim element; and because McFarland incorporates Ahmed '849 by reference, which has the same or substantially the same disclosure as

Ahmed, as discussed in Section V.B, for at least the same reasons McFarland also satisfies claim element 1[d].

244. As shown in Figure 2 of Ahmed '849, each of the modules within a space control subsystem include a nonvolatile memory (labeled as "NV MEM") in the figure. Indeed, in reference to an example embodiment, Ahmed '849 discloses that "sensor module 204 includes a MEMS local RF communication circuit 210, a microcontroller 212, a programmable non-volitive [*sic*] memory 214, a signal processing circuit 216, and one or more MEMS sensors devices 218" (Ahmed '849, [0040], emphasis added). Ahmed '849 as discloses that programmable non-volatile memory 214 "may be embodied as a flash programmable EEPROM" (Ahmed '849, [0044]), and Figure 7a of Ahmed '849 clearly depicts this EEPROM memory as part of the module circuitry alongside a processing circuit and sensor suite.

245. A POSITA would recognize that the EEPROM is utilized to store programing for execution by the processor, as well as information utilized by the processor, at least because embedded EEPROM memory is typically used in microprocessor systems for these purposes. In any event, Ahmed '849 expressly discloses that the non-volatile memory of the modules is in communication with the processor by explaining, at length, that this memory contains configuration information that is utilized by the processor and that the processor can write into the memory (i.e., the memory is necessarily in communication with the processor). For example, Ahmed '849 discloses that "[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information" (Ahmed '849, [0047]). Accordingly, Ahmed '849 discloses "a memory in communication with the processor" as required by claim element 1[d] of the '282 patent.

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246. The storage of sensor data provided by the sensor package within the non-volatile memory of the modules is inherent in the sensor modules, since these modules convert the analog signals from embedded MEMS sensor devices into digital signals for RF transmission, which a POSITA would understand requires storage of the sensor data, at least temporarily, within a cache or other memory within the sensor module. More specifically, a POSITA would recognize that the flash EEPROM memory within a sensor module is a convenient memory in which to store sensor data after this has been derived from analog sensor data and before it has been transmitted by the RF communication system. Moreover, a POSITA would understand that such storage is required since there is no guarantee that a transmission will occur exactly when data is acquired and thus storage of the sensor data is necessary at least until it is transmitted. This is consistent with the explicit disclosure in Ahmed '849 that "[t]he EEPROM 1254 also stores information related to the function in which the module 1200 will be used" (Ahmed '849, [0109]), since a POSITA would recognize that the function of a sensor module necessarily involves obtaining sensor data and this data will necessarily need to be stored between acquisition and transmission. Indeed, Ahmed '849 discloses that "the microcontroller 212 determines whether it is time to transmit an updated temperature value to the hub module 202 … [t]he determination of when to transmit temperature values may be driven by a clock internal to the sensor module 204, or in response to a request or query received from the hub mobile 202, or both" (Ahmed '849, [0085]). Therefore, a POSITA would recognize that storage of temperature values between their acquisition and subsequent transmission is required. Furthermore, the storage of sensor data within a sensor is a standard practice which would be expected by a POSITA as a normal feature in remote sensing devices required for their typical functionality.

247. In addition, Ahmed ’849 discloses that the non-volatile memory of the modules therein stores “computer readable instructions which are executable by the processor.” Indeed, in general, the invention claimed within Ahmed ’849 contemplates space control subsystems utilizing multiple different sensor modules that “have the same physical construction” wherein different sensor modules contain different “configuration information” to determine which of the multiple sensors therein are used by a given sensor module and how each sensor module operates within the control subsystem (*see*, e.g., Ahmed ’849, [0052]). More specifically, Ahmed ’849 discloses that “[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information” (Ahmed ’849, [0047]). More specifically, in relation to the describing how a sensor module may be configured to be a temperature sensor by programming the configuration information, Ahmed ’849 discloses that “[t]he microcontroller 212, responsive to the configuration information, causes the signal processing circuit 216 to process signals only from the temperature sensor, ignoring output from other sensors of the sensor suite 218” (Ahmed ’849, [0049]). Moreover, Ahmed ’849 explicitly discloses that the configuration within the memory includes code required for the processor to utilize the applicable sensors for a specific purpose, stating “in one embodiment of the invention, most or all of the code unique to the selected function of the module is downloaded into the EEPROM 1254 during configuration of the device … [t]hus, if the module 1200 is to operate as a temperature sensor module, then all appropriate code for a temperature sensor module is downloaded to the EEPROM 1254” (Ahmed, [0011]). Thus, the configuration information stored within the memory includes instructions that are executed by the processor to determine how to operate the sensor module.

248. Consequently, for at least the reasons above, it is my opinion that Ahmed ’849 discloses the requirements of claim element 1[d] of the ’282 patent.

249. In addition, I understand that Ollnova’s infringement contentions for claim element 1[d] do not address the requirement that a memory be “configured to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor,” and instead Ollnova merely identifies that the ecobee accused products include memory. Therefore, to the extent that Ollnova argues that McFarland or Ahmed ’849 do not disclose the requirements of claim element 1[d] due to some requirement associated with how the memory is configured or what information is stored therein, it should be noted that not only do McFarland and Ahmed ’849 expressly describe a memory that satisfies the requirements of claim element 1[d], but also that Ollnova’s own contentions merely require the presence of a memory. In other words, not only does McFarland and Ahmed ’849 disclose the requirements of claim element 1[d] of the ’282 patent, but it also satisfies Ollnova’s own infringement contentions regarding this claim element as I understand them.

f. **1[e] receive sensor control information related to sensor data in control at a second automation component in communication with the building automation system; and**

250. As an initial matter, I understand the Court has construed the term “receive sensor control information related to sensor data in control at a second automation component in communication with the building automation system” to mean “receive information that identifies which sensor or sensor value is driving or controlling a second automation component in communication with the building automation system.” I have applied this construction throughout my analysis.

251. McFarland discloses that in a second mode of operation, one or more sensor arrangements may receive control information from a second automation component in communication with the building automation system, such as a controller.

252. For example, in relation to figure 2 therein, McFarland states that "[t]he processor 32 has a processing power or capability and associated memory corresponding to the specific sensor 30 or corresponding to the needs of one of a plurality of different types of sensors 30 with a maximum desired processing power, such as an 8 or 16 bit processor" (McFarland, [0036], emphasis added). McFarland further states that "[b]y minimizing the processor requirements and associated memory, the cost of the sensor arrangement 16 may be reduced," where "[t]he processor 32 implements a control process algorithm specific to the sensor arrangement 16" (*Id*., emphasis added).

253. McFarland further explains that "[f]or example, a control algorithm is distributed on both a sensor processor 32 and an actuator processor 38 for performing a single or multiple functions," where "[t]he portion of the control algorithm corresponding to a specific device 16, 18, 20 is then operated or implemented at the specific device without the need of further control" (McFarland, [0043]). In this regard, "[t]he control algorithm for the temperature function with in [*sic*] the room is distributed on the different sensor arrangement 16 and actuator arrangements 20," and "[t]he sensor arrangement 16 in this corresponding control algorithm outputs information specific to the sensing function without information indicating an act to be performed" (McFarland, [0043]).

254. McFarland further discloses that "[i]n another mode of operation, the controllers override the sensor and/or actuators to alter processing based on a regional or larger area control process." (McFarland, [0027]; see also Abstract, [0006], [0050]). The disclosed regional control or "override" by the controllers includes, for example, transmission of operation control instructions,

instructions to direct certain sensor data, and communication settings, that are received by the sensor arrangements.

255. For example, McFarland states that transceiver 44 of controller 22 "is operable to send and/or receive information to and/or from any of the sensor arrangements 18, actuator arrangements 20, or other devices 18," where "[i]nformation from various ones of the devices 16, 18 and 20 may be received at the same or different times by the transceiver 44 for aggregate processing and routing by the processor 42" (McFarland, [0053]). McFarland further states that "[t]he transceiver 44 is also operable to transmit information to multiple or specific ones of the devices 16, 18, 20," where such information includes "[f]or example, binding associations, control instructions, communications settings or other information.") (*Id*.).

256. McFarland further states that "[i]n overriding local control, the higher level wireless network 12 and controllers 22 are operable to instruct redirection of data, such as sensor data from the sensor arrangement 16 to the higher level wireless network 12" (McFarland, [0060]). McFarland also indicates that, "[a]s another alternative, the sensor and/or actuator arrangements 16, 20 request control input from one or more controllers 22" (*Id*.). As one example, an actuator may forward sensor data received from one or more sensor arrangements to a controller (alone or in the aggregate), whereafter "[t]he controller 22 outputs control instructions for the actuator arrangement 20 or another device or uses the transmitted information without further control output," and the actuator or other devices then performs tasks consistent with the control instructions received from the controller (*Id*., see also [0061]).

257. With respect to use and redirection of sensor data, McFarland explicitly states that a controller transceiver "is operable to send and/or receive information to and/or from any of the sensor arrangements 18, actuator arrangements 20, or other devices 18," and that the transceiver

"is also operable to transmit information to multiple or specific ones of the devices 16, 18, 20." (McFarland, [0053], emphasis added). McFarland further states that controllers may instruct one or more sensor arrangements to perform functions (e.g., adjust set point temperatures), and "[a]ny use of data from multiple sensors and/or actuators, such as data from multiple rooms or other aggregates of data outside of or different than the bindings established for the lower level wireless network 14, are performed by one or more controllers 22" (McFarland, [0062]).

258. Taken together, a POSITA would have understood McFarland's disclosures to describe one or more automation components (e.g., sensor arrangements 16) that may receive control information from a second automation component (e.g., controller 22) in communication with the building automation system, where such information may be an identification of sensor or sensor values driving or controlling the second automation component (e.g., control information identifying of particular sensors or sensor data required by the controller, and that requires redirection to the controller for use by the controller and/or other components within the higher level wireless network). Accordingly, the sensor and actuator arrangements of McFarland "receive information that identifies which sensor or sensor value is driving or controlling a second automation component in communication with the building automation system," and it is my opinion that McFarland discloses the requirements of claim element 1[e] of the '282 patent.

259. For at least the reasons detailed in relation to Section VI.C.f, Ahmed satisfies this claim element; and, because McFarland incorporates Ahmed '849 by reference, which has the same or substantially the same disclosure as Ahmed, as discussed in Section V.B, for at least the same reasons McFarland also satisfies claim element 1[e].

260. As detailed in relation to claim 1[d], Ahmed '849 discloses "configuration information" that may be wirelessly received by a module within a space control subsystem to determine how

the module functions. More broadly, also as detailed in relation to claim element 1[d], Ahmed '849 contemplates a network of multiple modules, where each module is the same but may be configured to perform different functions using stored configuration information that determines, for example, which sensors are utilized and how the processor operates the module. *See* claim element 1[d]. More specifically, Ahmed '849 discloses that each module therein "may readily be configured as any one of a large plurality of sensor types or even other types of building automation system components … reducing the per-unit tooling and design costs associated with ordinary building automation sensors … [i]t will be noted that the design of module 1200 may not only be used as the sensor modules 204, 206 in exemplary space control subsystem 200 of FIG. 2, but may also be used as the hub module 202" (Ahmed '849, [0113]). Thus, Ahmed '849 explicitly discloses automation components within a building automation system in which each component may be configured, using configuration information received by the component, to perform a given subset of its possible functions and to perform in various roles required by the building automation system.

261. More generally, in reference to a module, Ahmed '849 discloses that "[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information" (Ahmed '849, [0047]). That is, Ahmed '849 discloses that an automation component "receives" configuration information via its wireless communication device and that this received configuration information is stored in the memory and utilized by the processor to determine how to operate the automation component.

262. Further, the configuration information identifies "sensor or sensor value is driving or controlling a second automation component." More specifically, Ahmed '849 discloses that the

configuration information determines which sensor or sensors are required for an automation component's function, such as in relation to configuring a sensor module to operate as a temperature sensor as part of an HVAC system. Ahmed '849 discloses "the EEPROM 704 may store information identifying that module 600 should enable its temperature sensing function as opposed to any of its other possible sensing functions" (Ahmed, [0109]).

263. Ahmed '849 provides further details, disclosing that the microprocessor within a sensor module uses the configuration information "to cause the appropriate sensor device or devices from the sensor device suite 218 to be operable connected to the signal processing circuit such that sensed signals from the appropriate sensor device are digitized and provided to the microcontroller 212 … the microcontroller 212 may also use the configuration information to format outgoing messages and/or control operation of the RF communication circuit 210" (Ahmed '849, [0047]). Moreover, in relation to the example embodiment where the sensor module is part of a HVAC control system, Ahmed '849 discloses that "[t]he microcontroller 212, responsive to the configuration information, causes the signal processing circuit 216 to process signals only from the temperature sensor, ignoring output from other sensors of the sensor suite 218" (Ahmed '849, [0049]). Thus, Ahmed '849 explicitly discloses that the configuration information, which is received by a module via the module's RF communication device, identifies the sensor or sensor values that the module should process and transmit.

264. Furthermore, Ahmed '849 describes that the example space control system of Fig. 2 is a kind of HVAC system in which "sensor module 204 is configured to enable its temperature sensing function" (Ahmed, [0042]); "sensor module 206 is configured to operate as a flow sensor" (Ahmed, [0052]); "actuator module 208 … is operable to control the position of a ventilation damper, thereby controlling the flow of heated or chilled air into the room" (Ahmed '849, [0053]);

and "hub module 202 … performs the function of the loop controller (e.g., a PID controller) for the space control subsystem 110" (Ahmed '849, [0059]). Thus, Ahmed '849 discloses an example embodiment of a space control system where a temperature sensor, flow sensor, and damper actuator are coordinated via a controller to perform HVAC operations.

265. Accordingly, a POSITA would understand that the temperature sensor provides the inside temperature to the hub, which then determine whether or not adjustments to the actuator are required to enforce programmed temperature settings. Indeed, Ahmed '849 states that hub module 202 "obtains process variable values (i.e., sensor information) from either or both of the sensor modules 204 and 206 and generates control output values," "provides the control output values to the actuator module 208," and also "communicates with external elements of the building control system, for example the supervisory computer, fan or chiller control subsystems, and other room controller subsystems" (Ahmed '849, [0059], *see also* Ahmed '849, [0069]).

266. Therefore, at least because Ahmed '849 explicitly contemplates the use of multiple similar modules which are configured to perform a particular role by configuration information programmed into each module memory, and because the sensor modules are connected to the supervisory computer via the hub modules, each sensor module receives configuration information from a hub module to cause it to function as required by the hub. More specifically, when configuring a space control subsystem of Ahmed '849 for its purpose, the appropriate configuration information must be transmitted to each sensor module from the hub. Indeed, a POSITA would understand configuration could be achieved via the supervisory computer—which facilitates network management and coordination of communication of data and control signals (Ahmed '849, [0082]). Thus, Ahmed '849 discloses that a module configuration, which a POSITA

would understand involves, for example, a controller requisitioning required sensor modules for its assigned control processes via distributing corresponding configuration information.

267. Consequently, for at least the reasons above, the configuration information of Ahmed ’849 is received by sensor modules within space control subsystems from hub modules within the same building control system, and this configuration information is used by the sensor modules to identify which sensor values are required to be transmitted to the hub module. Accordingly, the modules of Ahmed ’849 “receive information that identifies which sensor or sensor value is driving or controlling a second automation component in communication with the building automation system,” and it is my opinion that Ahmed ’849 discloses the requirements of claim element 1[e] of the ’282 patent.

268. In addition, I understand that Ollnova’s infringement contentions for claim element 1[d] do not address the requirements set forth in the Court’s claim construction, which are reflected in the patent specification, and instead Ollnova merely identifies that the ecobee accused products receive certain information, such as parameter updates. Therefore, to the extent that Ollnova argues that McFarland or Ahmed ’849 do not disclose the requirements of claim element 1[e] due to some requirement associated with sensor control information, it should be noted that not only do McFarland and Ahmed ’849 expressly describe information that satisfies the requirements of claim element 1[e], but also that Ollnova’s own contentions merely require the reception of information concerning (e.g., parameter updates, without necessarily including the features required by the Court’s construction). In other words, not only does McFarland and Ahmed ’849 disclose the requirements of claim element 1[e] of the ’282 patent, but it also satisfies Ollnova’s own infringement contentions regarding this claim element as I understand them.

g. **1[f] communicate a portion of the stored sensor data corresponding to the received sensor control information to the second automation component.**

269. For at least the reasons detailed in relation to claim element 1[e], a sensor arrangement of McFarland (i.e., an example "automation component") communicates a portion of its stored data corresponding to the received sensor control information from a controller (i.e., an example "second automation component") within the same building automation system. More specifically, as detailed in relation to previous claim elements of claim 1, each sensor arrangement within a building automation system of McFarland receives control information, which may be wirelessly transmitted to each sensor arrangement from one or more controllers; this configuration information is used by each sensor module to identify which sensor or sensor data is needed by the controller (or other high level network components) for control processes, and the corresponding sensor data is transmitted.

270. Consequently, for at least the reasons above, it is my opinion that McFarland discloses the requirements of claim element 1[f] of the '282 patent. Furthermore, for at least the reasons detailed in relation to Section VI.C.g, Ahmed satisfies this claim element; and, because McFarland incorporates Ahmed '849 by reference, which has the same or substantially the same disclosure as Ahmed, as discussed in Section V.B, for at least the same reasons McFarland also satisfies claim element 1[f].

271. For at least the reasons detailed in relation to claim element 1[e], a sensor module of Ahmed '849 (i.e., an example "automation component") communicates a portion of its stored data corresponding to the received sensor control information from a controller hub (i.e., an example "second automation component") within the same building automation system. More specifically, as detailed in relation to previous claim elements of claim 1, each sensor module within a space control subsystem of the building automation system of Ahmed '849 receives "configuration

information," which may be wirelessly transmitted to each sensor module from a controller hub; this configuration information is used by each sensor module to identify which of several different kinds of available sensor data is needed by the hub for the hub's control processes, and the corresponding sensor data is transmitted to the controller hub.

272. Consequently, for at least the reasons above, it is my opinion that Ahmed '849 discloses the requirements of claim element 1[f] of the '282 patent.

273. Therefore, for all of the reasons above, it is my opinion that McFarland and Ahmed '849, which is incorporated into McFarland by reference, discloses or renders obvious to a POSITA each and every limitation of claim 1 of the '282 patent.

ii.Claim 6

274. Claim 6 of the '282 Patent recites:

> The automation component of claim 1, wherein all of the stored sensor data is communicated at a regular interval.

275. Claim 6 of the '282 depends upon claim 1 therein, and includes additional limitations pertaining to periodic transmission of all stored sensor data.

276. McFarland discloses that sensor data stored in one or more sensor arrangements may be transmitted at set times. For example, McFarland states "[i]n alternative embodiments, bound devices 16, 18, 20 are operated through time division multiplexing, such as a specific sensor arrangement 16 transmitting at a same time as a specific actuator arrangement 20 is operable to receive transmitted information" (McFarland, [0048]). McFarland further explains that "[i]Information from various ones of the devices 16, 18 and 20 may be received at the same or different times by the transceiver 44 for aggregate processing and routing by the processor 42," where "[t]he transceiver 44 is also operable to transmit information to multiple or specific ones of the devices 16, 18, 20." (McFarland, [0053]).

277. While McFarland does not expressly state that transmission of sensor data at set times may include a set time interval, a POSITA would have understood that the operations of the sensor arrangement disclosed in McFarland would generate sensor data during operation, and that in order for the controller to receive such sensor data over time, the sensor data would need to be transmitted repeatedly over time. Given the contemplation of transmission coordination concerns disclosed in McFarland, a POSITA would have understood that one way to address this issue would be through a set interval during which stored sensor data is communicated. Implementing an interval-based transmission could be carried out, for example, through the configuration information received by the sensor module, as discussed above.

278. Further, for at least the reasons detailed in relation to Section VI.C.ii, Ahmed satisfies this claim element; and, because McFarland incorporates Ahmed ’849 by reference, which has the same or substantially the same disclosure as Ahmed, as discussed in Section V.B, for at least the same reasons McFarland also satisfies claim 6.

279. For at least the reasons detailed above in relation to claim 1, it is my opinion that Ahmed ’849 discloses each and every limitation of claim 1 of the ’282 patent; and, for at least the reasons below, it is my opinion that Ahmed ’849 also renders obvious the limitations added to this claim by claim 6.

280. Ahmed ’849 discloses periodic transmission of sensor data from sensor modules, stating, for example, “[t]he microcontroller 212 may cause the transmission of sensor data from time-to-time as dictated by an internal counter or clock” (Ahmed ’849, [0046]), and the “[n]ew sensor and/or setpoint values may be received periodically either on a schedule, or in response to requests generated by the processor 272” (Ahmed ’849, [0083]).

281. Ahmed ’849 discloses that configuration information determine which sensor data is transmitted from each sensor module (*see* claim 1), and a POSITA would recognize that configuration such that all of the stored sensor data is transmitted is merely an application-specific design choice. For instance, if the sensor module included temperature, humidity, and occupancy sensors, it would be obvious to a POSITA that all of the sensor data may be utilized by an HVAC system such that, for example, room temperature could be controlled based on humidity and occupancy—such as lower temperatures may be desirable for higher humidity temperatures to optimize comfort, and different comfort or zoning considerations may be applied based on which rooms are occupied.

282. Consequently, for at least the reasons above, it is my opinion that claim 6 of the ’282 patent is obvious to a POSITA in view of McFarland and Ahmed ’849 (which is incorporated into McFarland).

E. Claims 1, 3, 6, 20, and 21 of the ’282 Patent are anticipated or obvious to a POSITA in view of Ahmed in combination with Kates

i. Motivation to combine Ahmed with Kates

283. It is my opinion that a POSITA looking to the teachings of Ahmed would have additionally looked to the teachings of Kates and been motivated to combine these prior art references for the reasons detailed below, and by doing so, would have arrived independently at a system that satisfies each and every limitation of asserted Claims 1, 3, 6, 20, and 21 of the ’282 Patent.

284. As detailed in Section V, Ahmed and Kates are both directed to systems comprising wireless networks of components for monitoring and/or control of environmental conditions in a building. Both Ahmed and Kates disclose sensor components positioned in a building with the capability of wirelessly communicating information with a supervisory computer or base unit through an intermediate component, and both references disclose that applications of their

respective systems include, for example, fire safety. The two references even disclose some of the same wireless communication protocols for transmitting and/or receiving the sensor signals (e.g., Bluetooth). Thus, both Ahmed and Kates are within the same field of endeavor and present similar systems to be used in similar applications.

285. Ahmed considers that a drawback to the current state of building monitoring and control systems "is the amount of wiring involved in connecting all of the elements of the system" (Ahmed, [0007]), and indicates that the invention discloses therein is intended to address the "need for a building control system that reduces the wiring requirements of the current systems (Ahmed, [0008]). Kates teaches that sensors may be used to detect adverse conditions within a building but acknowledges the drawback of incorporating such sensors throughout a building, according to the approaches of the prior art, adds additional wiring to support and power the sensors, which results in expensive installations (*see* Kates, [0004]). Kates' wireless sensor system seeks to address this problem by removing the need for additional wiring. Thus, both Ahmed and Kates are also directed to solving some of the very same problems with some of the very same solutions. In particular, both references disclose the use of wireless communications as a general means of overcoming the physical wiring requirements of prior art systems.

286. Furthermore, as part of their respective solutions, Ahmed and Kates both consider the use of low power sensor units for conserving energy when no hardwired lines are present to supply traditional power sources. A POSITA in possession of Ahmed would have additionally looked to the teachings of Kates because these references disclose complementary solutions for enabling the use of such low power components.

287. Ahmed discloses "a building control system that incorporates wireless communications and/or microelectromechanical ('MEMS') technology" (Ahmed, [0009]). Ahmed further teaches

that the incorporation of wireless communications in a building control system will result in "at least some of the wiring employed for data communication may be eliminated," which would naturally lead to lower power consumption requirements and, for example, "[b]attery powered sensor modules [that] may be implemented completely within wiring" (Ahmed, [0009]). Ahmed's solution to address the matter of energy resource conservation pertains to the communication circuits themselves. For example, Ahmed states "[t]he use of a MEMS-based RF communication circuit allows for reduced power consumption, thereby enabling the potential use of a true wireless, battery operated sensor module 204" (Ahmed, [0040])

288. Kates discloses that "[i]n order to conserve battery power, the sensor is normally placed in a low-power mode," and "while in the low power mode, the sensor unit takes regular sensor readings and evaluates the readings to determine if an anomalous condition exists" (Kates, [0033]). In the invention of Kates, upon evaluation of the readings, "[i]f an anomalous condition is detected, then the sensor unit 'wakes up' and begins communicating with the base unit or with a repeater" (Kates, [0033]). Broadly, this power saving functionality demonstrates that the teachings of Kates allows for automation components comprising sensors to elongate battery life by only checking the values of sensors at regularly defined intervals, which occur at "programmed intervals," at which "the sensor unit 102 also 'wakes up' and sends status information (e.g., power levels, self[-]diagnostic information, etc.) to the base unit (or repeater) and then listens for commands for a period of time" (Kates, [0033]).

289. Thus, Kates discloses techniques and methods to employ power saving functionality with the use of algorithms for reducing power consumption to maximize the length of operation of automation components. In view of Ahmed's approach choice of communication circuits to achieve lower power consumption requirements of a building automation system, a POSITA

would have recognized the benefit of utilizing the disclosures of Kates to leverage its additional power saving methods within the system of Ahmed.

290. It would have been obvious to a POSITA seeking to implement the low power communication circuits within modules of one of Ahmed's space control subsystems, to incorporate the energy saving approach of Kates—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—in order to increase the battery lifetime of Ahmed's modules and reduce maintenance costs for building automation systems implemented with these modules.

291. Moreover, a POSITA would have recognized that the disclosures of Ahmed and Kates are compatible with each other and would have been able to implement the above-described combination without undue experimentation to achieve predictable results. That is, the specific combination of Ahmed and Kates that a POSITA would have been motivated to make could be employed with the physical architecture disclosed by Ahmed, and thus would not have required significant design changes or further engineering. Rather, the combination would have only required a POSITA to implement the logical communication sequencing disclosed by Kates on the existing system of Ahmed. I note that Kates was not before the examiner during prosecution of the application that issued as the '282 patent.

292. Thus, for reasons described above as well as those discussed in the claim-by-claim analysis below, it is my opinion that a POSITA have been motivated to combine Ahmed and Kates to arrive at the specific combination of these prior art references detailed above.

ii.Claim 1

293. Claim 1 of the '282 Patent recites:

> An automation component configured for wireless communication within a building automation system, the automation component comprising:
>
> a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable;
>
> a wireless communications component;
>
> a processor in communication with the wireless communications component and the sensor package;
>
> a memory in communication with the processor, the memory configured to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor; wherein the computer readable instructions are programmed to:
>
> receive sensor control information related to sensor data in control at a second automation component in communication with the building automation system; and
>
> communicate a portion of the stored sensor data corresponding to the received sensor control information to the second automation component.

294. Thus, claim 1 of the ’282 patent is directed towards a wireless automation component within a building automation system, and includes limitations pertaining to selective communication of sensor data between different automation components within the building automation system. For at least the reasons detailed below, each and every limitation of claim 1 of the ’282 patent is obvious to a POSITA in view of the combination of Ahmed with Kates detailed in Section VI.E.i.

a. **1[pre] An automation component configured for wireless communication within a building automation system, the automation component comprising:**

295. To the extent that the preamble of claim 1 of the ’282 patent is limiting, Ahmed discloses an automation component configured for wireless communication within a building automation system for at least the following reasons.

296. Ahmed discloses a wireless network of automation components within a building. For example, the abstract of Ahmed describes “[a] controller arrangement for a building system” which includes “a sensor module, an actuator module, and a controller,” wherein “[t]he sensor module comprises a wireless communication devices and a microelectromechanical system device operable to generate a process … [t]he actuator module comprises an actuation element and a wireless communication device … [t]he controller is operable to obtain the process value from the sensor module and provide a control output to the actuator module, the controller further operable to communicate with at least one of the sensor module and the actuator module using a wireless communication device.” Thus, Ahmed discloses a network of sensor devices, actuator devices, and controller devices, each of which may be an automation component as required by the preamble of claim 1 of the ’282 patent, and describes that these devices communicate wirelessly to enable actuators to be controlled based on signals from sensors.

297. More specifically, figure 1 of Ahmed (reproduced below), shows “a block diagram of an exemplary building control system” (Ahmed, [0013]) that includes “a wireless area network server 104, a chiller controller subsystem 106, a fan controller subsystem 108, and room controller subsystems 110, 112, and 114” and Ahmed is clear that this building control system is merely an example, stating that “[t]ypical building control systems will include many more space control

subsystems as well as many more chiller, fan, heater, and other building HVAC systems" (Ahmed, [0023]).

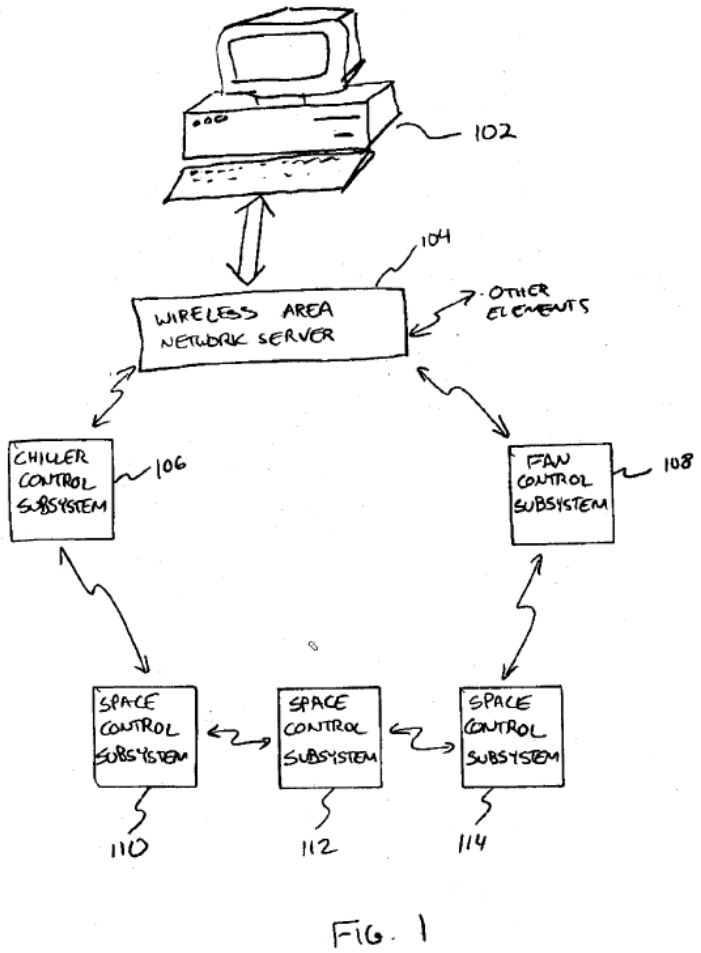


FIG. 1

Reproduction of Ahmed Figure 1.

298. Thus, Ahmed discloses a wireless area network that connects various control subsystems, where each control subsystem may be comprised of several automation components configured for wireless communication with the building control system. Indeed, in reference to "room controls 110, 112, and 114 of Figure 1, Ahmed describes that these subsystems are "local controller subsystems that operate to control an environmental aspect of a location or 'space' within the building" (Ahmed, [0027]) and that "each of the space control subsystems 110, 112 and 114 has

multiple elements that communicate with each other using a second wireless communication scheme such as Bluetooth" (Ahmed, [0028]).

299. Furthermore, Figure 2 of Ahmed (reproduced below) shows "a schematic block diagram of an exemplary room control system that may be used as the space control subsystems 110" (Ahmed, [0028]) that includes a "hub module 202," two "sensor modules 204 and 206," and one "actuator module 208" (Ahmed, [0029]). In an example embodiment discussed within Ahmed, the room control system of figure 2 is configured to control HVAC equipment whereby "[t]he first sensor module 204 represents a temperature sensor module and is preferable embodied as a wireless integrated network sensor" (Ahmed, [0030]), "[t]he sensor module 206 is configured to operate as a flow sensor" (Ahmed, [0044]), and "[t]he actuator module 208 … is operable to control the position of a ventilation damper, thereby controlling the flow of heated or chilled air into the room" (Ahmed, [0045]).

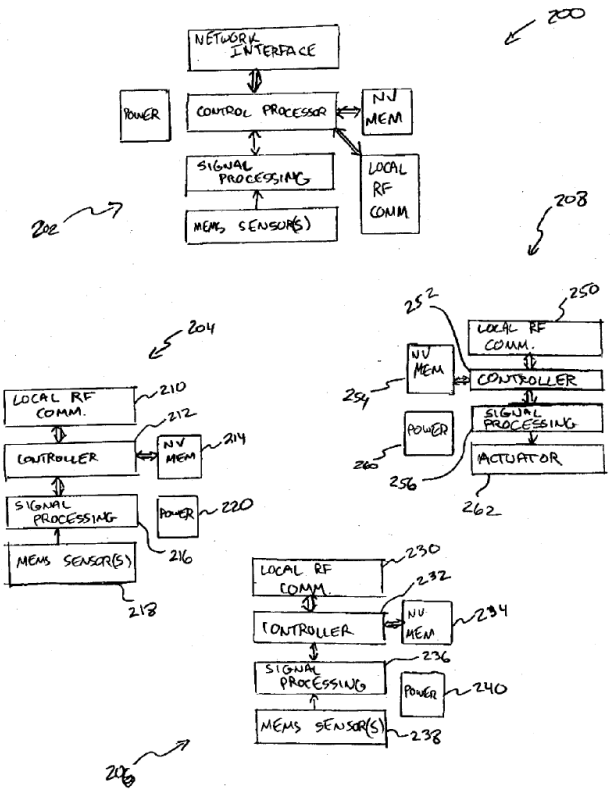


FIG. 2

Reproduction of Ahmed Figure 2.

300. Thus, each of modules 202, 204, 208, and 206 constitute example "automation components" as required by claim 1 of the '282 patent. Moreover, the hub module 202 including a "network interface" to communicate with other hub devices as well as "local RF comm" to wirelessly communicate with other modules; and modules 204, 208, and 206 also include "local RF comm" to allow wireless communication between modules; and Ahmed describes these modules as constituting parts of a building control system which function to autonomously control the environment within "spaces" or "rooms" in a building. Therefore, Ahmed discloses automation components that are configured for wireless communication within a building automation system.

301. In addition, to the extent that the preamble of claim 1 of the '282 patent is limiting, Kates also discloses an automation component configured for wireless communication within a building automation system for at least the following reasons.

302. Kates discloses a wireless automation device, for example Kates describes "[a] low cost, robust, wireless sensor system that provides an extended period of operability without maintenance" (Kates, Abstract). Moreover, Kates discloses a system for autonomous monitoring of anomalous conditions which performs alarm functionality in the event that such a condition is detected (*see,* e.g, Kates, Abstract). Kates additionally discloses "[i]n one embodiment, the sensor unit is bi-directional and configured to receive instructions from the central reporting station (or repeater). Thus, for example, the central reporting station can instruct the sensor to: perform additional measurements, go to a standby mode, wake up; report battery status, change wake-up interval, run self-diagnostics and report results, etc." (Kates, [0008]). The bi-directional, wireless sensor units of Kates which can receive and follow instructions constitutes automation components configured for wireless communication within a building automation system. Thus, for at least the reasons above, Kates discloses the requirements of the preamble of claim 1 of the '282 patent to the extent these are limiting.

303. In addition to each of Ahmed and Kates individually disclosing the requirements of the preamble of claim 1 of the '282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of these references which a POSITA would be motivated to make. More specifically, as detailed in Section VI.E.i, a POSITA would be motivated to incorporate the energy saving approach of Kates—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of Ahmed, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the combination of Ahmed and Kates which a POSITA would be motivated to make includes the

sensor modules of Ahmed, which, for at least the reasons detailed above, satisfy the requirements of the preamble of claim 1 of the ’282 patent.

304. Consequently, for at least the reasons above, to the extent that the preamble of claim 1 of the ’282 patent is limiting, it is my opinion this preamble is rendered obvious to a POSITA in view of the combination of Ahmed with Kates.

305. In addition, regarding the claim term “[first/second] automation component,” to the extent that this term applies to the “an automation component” of the claim 1 preamble I have applied the Court’s construction for this term in forming my opinions. More specifically, the Court has ordered that the term “[first/second] automation component” be construed to mean “[first/second] component designed to operate without human interaction in an automation system” and I have applied this construction in my analysis. The modules of Ahmed are used within a building control system to autonomously control the environment within a room of the building by operating actuator modules based on information from sensor modules, and thus operate without human interaction when performing their usual function. Similarly, the sensor units of Kates operate within an autonomous system for detecting anomalous conditions without human interaction until an alarm is triggered to potentially alert a human to the detected condition. In any event, Ahmed discloses a control subsystem consisting of temperature sensors, actuators, and controllers for controlling HVAC equipment (i.e., Ahmed discloses autonomous components consistent with Ollnova’s accusations), which purport that a thermostat controller and/or associated remote temperature sensors are allegedly automation components that satisfy claim 1 of the ’282 patent. Similarly, Kates discloses an autonomous system in which sensor units detect temperatures that are outside of a predetermined range in order to trigger alerts for high or low temperatures. In other words, in the event that Ollnova argues that the combination of Ahmed and Kates which a POSITA

would be motivated to make does not disclose the claimed autonomous components as construed by the Court, it should be noted that not only does this combination disclose automation components according to the Court's construction, but this combination satisfies Ollnova's own infringement theories, as far as these can be understood from its infringement contentions.

b. **1[a] a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable;**

306. Ahmed discloses wireless automation components that include a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable, for at least the following reasons.

307. As discussed in relation to the preamble of claim 1, Ahmed discloses a wireless building control system comprised of multiple "space control subsystems" networked together; where each space control subsystem is comprised of a hub that can wirelessly communicate to other subsystems as well as sensor modules and actuator modules within the local subsystem; and where each hub and module constitute an automation component of claim 1 of the '282 patent.

308. Ahmed also discloses that sensor modules can comprise multiple different sensors, each for sensing different variables, packed together into a sensor suite. More specifically, in reference to MEMS sensor module 218 within an example sensor module, Ahmed discloses that "[t]he MEMS sensor device(s) 218 include at least one MEMS sensor, which may suitably by a temperature sensor, flow sensor, pressure sensor and/or gas-specific sensor. In a preferred embodiment, several sensors are incorporated into a single device as a sensor suite 218" (Ahmed, [0032], emphasis added).

309. In yet more detail, Ahmed discloses that the several different sensors within a sensor suite may be fabricated onto a single semiconductor substrate. For instance, in relation to figure 6 (reproduced below), which shows "a side view of an exemplary wireless module" (Ahmed, [0018])

that is an example "single substate or single device solution for the sensor module 204" (Ahmed, [0031]), Ahmed states "a set of selectable sensor devices may further include, by way of example, a light sensor, a heat or smoke sensor, a movement sensor, and/or a biometric sensor … In accordance with one aspect of the invention, several known MEMS sensing technologies are incorporated into a single substrate" (Ahmed, [0033], emphasis added).

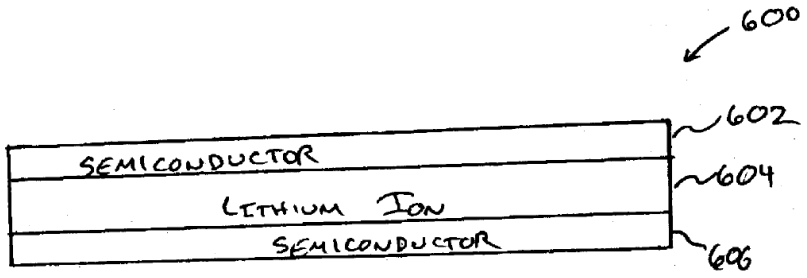


FIG. 6

Reproduction of Ahmed Figure 6.

310. At least because Ahmed discloses incorporating several MEMS sensors on the same semiconductor substrate and packaging this within a single sensor module, Ahmed discloses "a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detector variable." Indeed, a POSITA would recognize that integration of different sensors within a single substrate necessitates that these different sensors are packaged together, since otherwise the packaging would necessarily divide the semiconductor material into more than one substrate. Consequently, for at least the reasons above, it is my opinion that Ahmed discloses the requirements of claim element 1[a] of the '282 patent.

311. In addition, Kates discloses multiple different kinds of sensor packaged within a single sensor unit, stating in relation to example sensor units 102-106 that "[t]he sensor units 102-106 include sensors to measure conditions, such as, for example, smoke, temperature, moisture, water,

water, temperature, humidity, carbon monoxide, natural gas, security alarms, intrusion alarms (e.g., open doors, broken windows, open windows, and the like), other flammable gases, radon, poison gasses, etc." and that "[d]ifferent sensor units can be configured with different sensors or with combinations of sensors" (*see* Kates, [0030], emphasis added). Thus, Kates discloses multiple different sensors within a single sensor unit, which a POSITA would understand satisfies the requirement for "a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable."

312. In addition to each of Ahmed and Kates individually disclosing the requirements of claim element 1[a] of the '282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of these references which a POSITA would be motivated to make. More specifically, as detailed in Section VI.E.i, a POSITA would be motivated to incorporate the energy saving approach of Kates—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of Ahmed, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the sensor modules of Ahmed—which include multiple different MEMS sensors packaged within the same semiconductor substrate—are included within the combination of Ahmed with Kates which a POSITA would be motivated to make, and therefore, for at least the reasons above, this combination satisfies the requirements of claim element 1[a].

313. Consequently, for at least the reasons above, it is my opinion that claim element 1[a] of the '282 patent is rendered obvious to a POSITA in view of Ahmed in combination with Kates.

314. In addition to satisfying the requirements of the claim language as these would be understood by a POSITA, the combination of Ahmed with Kates also satisfies the position within

Ollnova's infringement contentions pertaining to claim element 1[a] of the '282 patent. More specifically, Ollnova's contentions do not address the packaging of multiple sensors at all, and instead contend that each ecobee thermostat comprises a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detector variable merely because ecobee thermostats include temperature, humidity, occupancy, and proximity sensors. As discussed above, each of Ahmed and Kates explicitly discloses devices that include multiple different kinds of sensor. In other words, in the event that Ollnova argues that the combination of Ahmed with Kates does not disclose a multi-sensor package, it should be noted that not only does Ahmed disclose multiple different MEMS sensors fabricated into a single semiconductor substrate while Kates discloses multiple different sensors within the same sensor unit—each of which satisfies the requirements of a multi-sensor package—but these same disclosures also satisfy the broader position within Ollnova's contentions which merely requires more than one kind of sensor within a device regardless of how these are packaged.

c. **1[b] a wireless communications component;**

315. Ahmed discloses wireless automation components, as discussed in relation to the preamble of claim 1 of the '282 patent, and thus these automation components satisfy the requirements of claim element 1[b] of including "a wireless communications component."

316. Indeed, Ahmed discloses that each "sensor module," "actuator module," and "controller" include "a wireless communication device" (*see* Ahmed, Abstract). For example, in general, Ahmed discloses that the controller hubs, sensor modules, and actuator modules of the building control system therein each include local radio frequency communication capabilities, labeled "local RF Comm" in Ahmed Figure 2, and discloses that "sensor module 204 includes a MEMS

local RF communication circuit 210" (Ahmed, [0030]) as well as describing that these modules utilize "a short-range or local RF communication scheme such as Bluetooth" (Ahmed, [0028]).

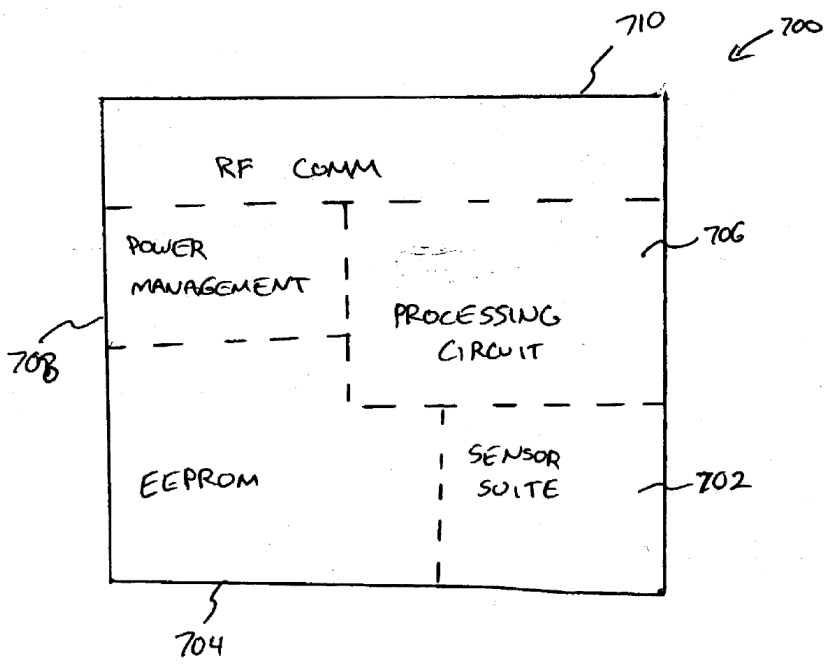


FIG. 7

Reproduction of Ahmed Figure 7.

317. More specifically, figure 7 of Ahmed (reproduced above) shows "a block diagram of a module circuit" (Ahmed, [0019]) that includes "an RF communication circuit 710" (Ahmed, [0089]), and discloses that "[t]he RF communication circuit 710 is a MEMs based communication circuit … [and] is preferably configured to communicate using at least one local RF communication format, such as Bluetooth" (Ahmed, [0090]).

318. Therefore, for at least the reasons above, the modules of Ahmed include RF communication capabilities implemented via an RF communication circuit, and thus these modules include a wireless communication component as required by claim element 1[b]. Consequently, for at least the reasons above, it is my opinion that Ahmed discloses the requirements of claim element 1[b] of the '282 patent.

319. In addition, Kates discloses a wireless automation device, for example Kates describes "[a] low cost, robust, wireless sensor system that provides an extended period of operability without maintenance" (Kates, Abstract). Kates additionally discloses "[i]n one embodiment, the sensor unit is bi-directional and configured to receive instructions from the central reporting station (or repeater). Thus, for example, the central reporting station can instruct the sensor to: perform additional measurements, go to a standby mode, wake up; report battery status, change wake-up interval, run self-diagnostics and report results, etc." (Kates, [0008]). Moreover, Figure 2 of Kates shows that the sensor units therein include "a transceiver 203" (Kates, [0050]) The bi-directional, wireless sensor system which can receive and follow instructions constitutes a wireless automation device.

320. Thus, for at least the reasons detailed above, Kates discloses a wireless automation device as required by the preamble to claim 1 of the '282 patent.

321. In addition to each of Ahmed and Kates individually disclosing the requirements of claim element 1[b] of the '282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of these references which a POSITA would be motivated to make. More specifically, as detailed in Section VI.E.i, a POSITA would be motivated to incorporate the energy saving approach of Kates—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of Ahmed, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the sensor modules of Ahmed—which include a wireless communications component—are included within the combination of Ahmed with Kates which a POSITA would be motivated to make, and

therefore, for at least the reasons above, this combination satisfies the requirements of claim element 1[b].

d. **1[c] a processor in communication with the wireless communications component and the sensor package;**

322. This claim element requires a processor that is in communication with the wireless communications component of claim element 1[b] and the sensor package of element claim 1[a]. For at least the following reasons, Ahmed discloses that the modules therein satisfy the requirements of claim element 1[c].

323. As detailed in relation to claim elements 1[a] and 1[b], the modules of the space control subsystems of Ahmed each include a multi-sensor package and a wireless communications component. In addition, Ahmed discloses that a processor is also within each module and that this processor is in communication with the wireless communications component and the sensor package. For example, Ahmed discloses, in relation to an example sensor module 204, that "sensor module 204 includes a MEMS local RF communication circuit 210, a microcontroller 212, a programmable non-volative [*sic*] memory 214, a signal processing circuit 216, and one or more MEMS sensor devices 218" (Ahmed, [0030], emphasis added).

324. Similarly, in relation to figure 7 therein—which, as discussed in relation to claim element 1[b], depicts a block diagram of an example module—each "module circuit 700 include[s] a sensor suite 702, an EEPROM 704, a processing circuit 706, a power management circuit 708 and an RF communication circuit 710" (Ahmed, [0089]), wherein "[t]he processing circuit 706 preferably incorporates a microprocessor or microcontroller, as well as microelectronics A/D circuits for connecting to the MEMs sensor devices of the sensor suite 702" (Ahmed, [0093]), "the signal processing circuit 706 otherwise controls the operations of the module" (Ahmed, [0093]), "[t]he signal processing circuit 706 obtains the programming instructions from the RF communication

circuit 710 and stores the instructions into the EEPROM 704" (Ahmed, [0097]) and "the processing circuit 706 is configured to generate digital or analog outputs to a wide range of actuator devices … [and] includes digital to analog and analog to digital conversion circuitry to allow both sensor input and actuator output" (Ahmed, [0099]).

325. Thus, Ahmed explicitly discloses that each module includes a processor within the processing circuit 706, and that this processor controls the operations of the module. Moreover, the processor obtains instructions from the RF communication circuit, and provides A/D conversion for sensor inputs—i.e., the processor within processing circuit 706 is in communication with both the wireless communication component (RF communication circuit) and the sensors within the sensor suite (multi-sensor package). Consequently, for at least the reasons above, it is my opinion that Ahmed discloses the requirements of claim element 1[c] of the '282 patent.

326. In addition, Kates also discloses a wireless automation device in which a processor in is communication with the wireless communications component and the sensor package. More specifically, in a description of figure 2 of Kates (reproduced below), Kates states "[i]n the sensor unit 102, one or more sensors 201 and a transceiver 203 are provided to a controller 202" (Kates, [0050]), where "the transceiver 203 is based on a TRF 6901 transceiver chip from Texas Instruments" (Kates, [0051]). The TRF 6901 from Texas Instruments is a single-chip RF transceiver,[5] and thus it would be clear to a POSITA that the controller 203 is in communication with a wireless communications component (i.e., transceiver 203). Therefore, it would be clear to a POSITA that the controller 202 in a sensor unit of Kates would be in communication with a wireless communications component (i.e., transceiver 203) and the sensors within the sensor suite

[5] *See* TRF6901 product page by Texas Instruments, accessed April 17, 2023. TRF6901 data sheet, product information and support | TI.com

(i.e., one or more sensors 201), and that Kates consequently discloses the requirements of claim element 1[c].

327. In addition to each of Ahmed and Kates individually disclosing the requirements of claim element 1[c] of the ’282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of these references which a POSITA would be motivated to make. More specifically, as detailed in Section VI.E.i, a POSITA would be motivated to incorporate the energy saving approach of Kates—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of Ahmed, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the sensor modules of Ahmed—which include a processor that satisfies the requirements of claim element 1[c]—are included within the combination of Ahmed with Kates which a POSITA would be motivated to make, and therefore, for at least the reasons above, this combination satisfies the requirements of claim element 1[c].

328. Consequently, for at least the reasons above, it is my opinion that the combination of Ahmed and Kates discloses the requirements of claim element 1[c] of the ’282 patent.

329. In addition, I note that Ollnova’s infringement contentions for claim element 1[c] do not address at all the requirement that a processor be “in communication with the wireless communications component and sensor package,” and instead Ollnova merely identifies a processor within the accused ecobee thermostat devices. Therefore, to the extent that Ollnova argues that the combination of Ahmed with Kates does not disclose the requirements of claim element 1[c] due to some requirement associated with communication between the processor and the wireless communication component or sensor package, it should be noted that not only does

this combination expressly describe a processor within the modules therein that both receives information from the RF communication circuit and processes sensor inputs, but also that Ollnova's own contentions merely require the presence of a processor within a device that has sensors. In other words, not only does the combination of Ahmed with Kates disclose the requirements of claim element 1[c] of the '282 patent, but it also satisfies Ollnova's own infringement contentions regarding this claim element.

e. **1[d] a memory in communication with the processor, the memory configured to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor; wherein the computer readable instructions are programmed to:**

330. Ahmed discloses that the modules therein include a memory in communication with the processor, and for at least the reasons below Ahmed discloses this memory being configured as required by claim element 1[d].

331. As shown in Figure 2 of Ahmed, each of the modules within a space control subsystem include a nonvolatile memory (labeled as "NV MEM") in the figure. Indeed, in reference to an example embodiment, Ahmed discloses that "sensor module 204 includes a MEMS local RF communication circuit 210, a microcontroller 212, a programmable non-volitive [*sic*] memory 214, a signal processing circuit 216, and one or more MEMS sensors devices 218" (Ahmed, [0030], emphasis added). Ahmed as discloses that programmable non-volatile memory 214 "may be embodied as a flash programmable EEPROM" (Ahmed, [0036]), and Figure 7 of Ahmed clearly depicts this EEPROM memory as part of the module circuitry alongside a processing circuit and sensor suite.

332. A POSITA would recognize that the EEPROM is utilized to store programing for execution by the processor, as well as information utilized by the processor, at least because embedded EEPROM memory is typically used in microprocessor systems for these purposes. In any event,

Ahmed expressly discloses that the non-volatile memory of the modules is in communication with the processor by explaining, at length, that this memory contains configuration information that is utilized by the processor and that the processor can write into the memory (i.e., the memory is necessarily in communication with the processor). For example, Ahmed discloses that "[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information" (Ahmed, [0039]). Accordingly, Ahmed discloses "a memory in communication with the processor" as required by claim element 1[d] of the '282 patent.

333. The storage of sensor data provided by the sensor package within the non-volatile memory of the modules is inherent in the sensor modules, since these modules convert the analog signals from embedded MEMS sensor devices into digital signals for RF transmission, which a POSITA would understand requires storage of the sensor data, at least temporarily, within a cache or other memory within the sensor module. More specifically, a POSITA would recognize that the flash EEPROM memory within a sensor module is a convenient memory in which to store sensor data after this has been derived from analog sensor data and before it has been transmitted by the RF communication system. Moreover, a POSITA would understand that such storage is required since there is no guarantee that a transmission will occur exactly when data is acquired and thus storage of the sensor data is necessary at least until it is transmitted. This is consistent with Ahmed's explicit disclosure that "[t]he EEPROM 704 also store information related to the function in which the module 600 will be used" (Ahmed, [0094]), since a POSITA would recognize that the function of a sensor module necessarily involves obtaining sensor data and this data will necessarily need to be stored between acquisition and transmission. Indeed, Ahmed discloses that "the

microcontroller 212 determines whether it is time to transmit an updated temperature value to the hub module 202 … [t]he determination of when to transmit temperature values may be driven by a clock internal to the sensor module 204, or in response to a request or query received from the hub mobile 202, or both" (Ahmed, [0077]). Therefore, a POSITA would recognize that storage of temperature values between their acquisition and subsequent transmission is required. Furthermore, the storage of sensor data within a sensor is a standard practice which would be expected by a POSITA as a normal feature in remote sensing devices required for their typical functionality.

334. In addition, Ahmed discloses that the non-volatile memory of the modules therein stored "computer readable instructions which are executable by the processor." Indeed, in general, the invention claimed within Ahmed contemplates space control subsystems utilizing multiple different sensor modules that "have the same physical construction" wherein different sensor modules contain different "configuration information" to determine which of the multiple sensors therein are used by a given sensor module and how each sensor module operates within the control subsystem (*see*, e.g., Ahmed, [0044]). More specifically, Ahmed discloses that "[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information" (Ahmed, [0039]). More specifically, in relation to the describing how a sensor module may be configured to be a temperature sensor by programming the configuration information, Ahmed discloses that "[t]he microcontroller 212, responsive to the configuration information, causes the signal processing circuit 216 to process signals only from the temperature sensor, ignoring output from other sensors of the sensor suite 218" (Ahmed, [0041]). Moreover, Ahmed explicitly discloses that the

configuration within the memory includes code required for the processor to utilize the applicable sensors for a specific purpose, stating "in one embodiment of the invention, most or all of the code unique to the selected function of the module is downloaded into the EEPROM 704 during configuration of the device … [t]hus, if the module 600 is to operate as a temperature sensor module, then all appropriate code for a temperature sensor module is downloaded to the EEPROM 704" (Ahmed, [0096]). Thus, the configuration information stored within the memory includes instructions that are executed by the processor to determine how to operate the sensor module.

335. Consequently, for at least the reasons above, it is my opinion that Ahmed discloses the requirements of claim element 1[d] of the '282 patent.

336. In addition, Kates also discloses a wireless automation device in which a memory is in communication with the processor, the memory configured to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor. More specifically, in a description of Figure 2 of Kates (reproduced below), Kates states "[i]n the sensor unit 102, one or more sensors 201 and a transceiver 203 are provided to a controller 202" (Kates, [0050]), where "[i]n one embodiment, the controller 202 is based on a Field Programmable Gate Array (FPGA), such as, for example, provided by Xilinx Corp." (Kates, [0051]). Indeed, FPGAs manufactured by Xilinx Corp. ("Xilinx") did include memory in communication with the processor. For example, the Virtex-5 FPGA,[6] available by Xilinx in 2008, has enhanced 36 kbit Block Random Access Memory ("RAM") and an option for commodity flash memory. Additionally, one of the three available configurations available at the time of the invention is "[o]ptimized for DSP and memory-intensive application with low-power serial connectivity."

[6] See Virtex-5 product page by Xilinx, dated March 12, 2008, accessed April 19, 2023. Virtex-5 Multi-Platform FPGA (archive.org); ecobee-Ollnova-000091580-581.

Therefore, it would be clear to a POSITA that memory would be in communication with the controller 202 in a sensor unit of Kates.

337. Further, Kates discloses that "[t]he controller 202 receives sensor data," "the controller 202 evaluates the sensor data by comparing the data value to a threshold value," and that "the data threshold is programmed into the controller 202" (Kates, [0052]). A POSITA would recognize that configuring the controller 202 to store sensor data within the memory, even temporarily, prior to evaluating against a threshold stored in the memory would be an application-specific design choice. Thus, the instructions including a data threshold would be stored within the memory includes instructions that are executed by the controller to determine how to operate the sensor module.

338. Therefore, for at least the reasons above, it would be clear to a POSITA that memory is in communication with the controller 202 of Kates, and that the controller and its associated memory may be programmed to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor, and that Kates consequently discloses the requirements of claim element 1[d].

339. In addition to Ahmed and Kates each disclosing the requirements of claim element 1[d] of the '282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of Ahmed with Kates which a POSITA would be motivated to make. More specifically, as detailed in Section VI.E.i, a POSITA would be motivated to incorporate the energy saving approach of Kates—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of Ahmed, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the sensor modules of

Ahmed—which include the required memory and store sensor data prior to transmission—are included within the combination of Ahmed with Kates which a POSITA would be motivated to make, and therefore, for at least the reasons above, this combination satisfies the requirements of claim element 1[a].

340. In addition, I note that Ollnova's infringement contentions for claim element 1[d] do not address the requirement that a memory be "configured to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor," and instead Ollnova merely identifies that the ecobee accused products include memory. Therefore, to the extent that Ollnova argues that the combination of Ahmed with Kates does not disclose the requirements of claim element 1[c] due to some requirement associated with how the memory is configured or what information is stored therein, it should be noted that not only does this combination expressly describe a memory that satisfies the requirements of claim element 1[d], but also that Ollnova's own contentions merely require the presence of a memory. In other words, not only does the combination of Ahmed with Kates disclose the requirements of claim element 1[d] of the '282 patent, but it also satisfies Ollnova's own infringement contentions regarding this claim element.

f. **1[e] receive sensor control information related to sensor data in control at a second automation component in communication with the building automation system; and**

341. As an initial matter, I understand the Court has construed the term "receive sensor control information related to sensor data in control at a second automation component in communication with the building automation system" to mean "receive information that identifies which sensor or sensor value is driving or controlling a second automation component in communication with the building automation system." I have applied this construction throughout my analysis.

342. As detailed in relation to claim 1[d], Ahmed discloses "configuration information" that may be wirelessly received by a module within a space control subsystem to determine how the module functions. More broadly, also as detailed in relation to claim element 1[d], Ahmed contemplates a network of multiple modules, where each module is the same but may be configured to perform different functions using stored configuration information that determines, for example, which sensors are utilized and how the processor operates the module. *See* claim element 1[d]. More specifically, Ahmed discloses that each module therein "may readily be configured as any one of a large plurality of sensor types or even other types of building automation system components … reducing the per-unit tooling and design costs associated with ordinary building automation sensors … [i]t will be noted that the design of module 600 may not only be used as the sensor modules 204, 206 in exemplary space control subsystem 200 of FIG. 2, but may also be used as the hub module 202" (Ahmed, [0098]). Thus, Ahmed explicitly discloses automation components within a building automation system in which each component may be configured, using configuration information received by the component, to perform a given subset of its possible functions and to perform in various roles required by the building automation system.

343. More generally, in reference to a module, Ahmed discloses that "[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information" (Ahmed, [0039])—that is, Ahmed discloses that an automation component "receives" configuration information via its wireless communication device and that this received configuration information is stored in the memory and utilized by the processor to determine how to operate the automation component.

344. Further, the configuration information identifies which "sensor or sensor value is driving or controlling a second automation component." More specifically, Ahmed discloses that the configuration information determines which sensor or sensors are required for an automation component's function (e.g., in relation to configuring a sensor module to operate as a temperature sensor as part of an HVAC system). Ahmed discloses "the EEPROM 704 may store information identifying that module 600 should enable its temperature sensing function as opposed to any of its other possible sensing functions" (Ahmed, [0094]).

345. In more detail, Ahmed discloses that the microprocessor within a sensor module uses the configuration information "to cause the appropriate sensor device or devices from the sensor device suite 218 to be operable connected to the signal processing circuit such that sensed signals from the appropriate sensor device are digitized and provided to the microcontroller 212 … the microcontroller 212 may also use the configuration information to format outgoing messages and/or control operation of the RF communication circuit 210" (Ahmed, [0039]). Moreover, in relation to the example embodiment where the sensor module is part of a HVAC control system, Ahmed discloses that "[t]he microcontroller 212, responsive to the configuration information, causes the signal processing circuit 216 to process signals only from the temperature sensor, ignoring output from other sensors of the sensor suite 218" (Ahmed, [0041]). Thus, Ahmed explicitly discloses that the configuration information, which is received by a module via the module's RF communication device, identifies the sensor or sensor values that the module should process and transmit.

346. Furthermore, Ahmed describes that the example space control system of Figure 2 is a kind of HVAC system in which "sensor module 204 is configured to enable its temperature sensing function" (Ahmed, [0034]), "sensor module 206 is configured to operate as a flow sensor"

(Ahmed, [0044]), "actuator module 208 … is operable to control the position of a ventilation damper, thereby controlling the flow of heated or chilled air into the room" (Ahmed, [0045]), and "hub module 202 … performs the function of the loop controller (e.g., a PID controller) for the space control subsystem 110" (Ahmed, [0051]). Thus, Ahmed discloses an example embodiment of a space control system where a temperature sensor, flow sensor, and damper actuator are coordinated via a controller to perform HVAC operations.

347. Accordingly, a POSITA would understand that the temperature sensor provides the inside temperature to the hub, which then determine whether or not adjustments to the actuator are required to enforce programmed temperature settings. Indeed, Ahmed states that hub module 202 "obtains process variable values (i.e., sensor information) from either or both of the sensor modules 204 and 206 and generates control output values," "provides the control output values to the actuator module 208," and also "communicates with external elements of the building control system, for example the supervisory computer, fan or chiller control subsystems, and other room controller subsystems" (Ahmed, [0051], *see also* Ahmed, [0061]).

348. Therefore, at least because Ahmed explicitly contemplates the use of multiple similar modules which are configured to perform a particular role by configuration information programmed into each module memory, and because the sensor modules are connected to the supervisory computer via the hub modules, each sensor module receives configuration information from a hub module to cause it to function as required by the hub. More specifically, when configuring a space control subsystem of Ahmed for its purpose, the appropriate configuration information must be transmitted to each sensor module from the hub. Indeed, in addition to manual configuration, which a POSITA would understand could be achieved via the user interface provided by the supervisory computer—which facilitates network management and coordination

of communication of data and control signals (Ahmed, [0105])—Ahmed discloses that the processing circuits of modules therein "may also include inherent memory that incorporates routines for self-commissioning, self-configuring and fault diagnostics for the module 600" (Ahmed, [0099]). Thus, Ahmed discloses that a module can self-configure, which a POSITA would understand involves, for example, a controller requisitioning required sensor modules for its assigned control processes via distributing corresponding configuration information.

349. Consequently, for at least the reasons above, the configuration information of Ahmed is received by sensor modules within space control subsystems from hub modules within the same building control system, and this configuration information is used by the sensor modules to identify which sensor values are required to be transmitted to the hub module. Accordingly, the modules of Ahmed "receive information that identifies which sensor or sensor value is driving or controlling a second automation component in communication with the building automation system," and it is my opinion that Ahmed discloses the requirements of claim element 1[e] of the '282 patent.

350. In addition to Ahmed individually disclosing the requirements of claim element 1[e] of the '282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of Ahmed with Kates which a POSITA would be motivated to make. More specifically, as detailed in Section VI.E.i, a POSITA would be motivated to incorporate the energy saving approach of Kates—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of Ahmed, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the combination of Ahmed with Kates which a POSITA would be motivated to make includes the reconfigurable

modules of Ahmed which utilize "configuration information" in a way that satisfies the limitations of claim element 1[e], and therefore, for at least the reasons above, this combination satisfies the requirements of claim element 1[a].

g. **1[f] communicate a portion of the stored sensor data corresponding to the received sensor control information to the second automation component.**

351. For at least the reasons detailed in relation to claim element 1[e], a sensor module of Ahmed (i.e., an example "automation component") communicates a portion of its stored data corresponding to the received sensor control information from a controller hub (i.e., an example "second automation component") within the same building automation system. More specifically, as detailed in relation to previous claim elements of claim 1, each sensor module within a space control subsystem of the building automation system of Ahmed receives "configuration information," which may be wirelessly transmitted to each sensor module from a controller hub; this configuration information is used by each sensor module to identify which of several different kinds of available sensor data is needed by the hub for the hub's control processes, and the corresponding sensor data is transmitted to the controller hub.

352. Consequently, for at least the reasons above, it is my opinion that Ahmed discloses the requirements of claim element 1[f] of the '282 patent.

353. In addition to Ahmed individually disclosing the requirements of claim element 1[e] of the '282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of Ahmed with Kates which a POSITA would be motivated to make. More specifically, as detailed in Section VI.E.i, a POSITA would be motivated to incorporate the energy saving approach of Kates—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of Ahmed, in order to increase the battery lifetime of these modules and reduce maintenance costs

for building automation systems implemented with these modules. Thus, the combination of Ahmed with Kates which a POSITA would be motivated to make includes the reconfigurable modules of Ahmed which utilize "configuration information" to identify which sensor values should be communicated as required by claim element 1[f], and therefore, for at least the reasons above, this combination satisfies the requirements of claim element 1[f].

iii.Claim 3

354. Claim 3 of the '282 Patent recites:

> The automation component of claim 1, wherein the computer readable instructions are further programmed to: identify sensor values within the sensor data that exceed a corresponding change-of-value threshold.

355. Claim 3 of the '282 depends upon claim 1 therein, and includes additional limitations pertaining to the identification of sensor values within the stored sensor data that exceeds a change-of-value threshold. For at least the reasons detailed above in relation to claim 1, it is my opinion that the combination of Ahmed with Kates discloses each and every limitation of claim 1 of the '282 patent; and, for at least the reasons below, it is my opinion that the combination of Ahmed and Kates also renders obvious the limitations added to this claim by claim 3.

356. As detailed in relation to claim 1[d], Ahmed discloses "configuration information" that may be wirelessly received by a module within a space control subsystem to determine how the module functions. More broadly, also as detailed in relation to claim element 1[d], Ahmed contemplates a network of multiple modules, where each module is the same but may be configured to perform different functions using stored configuration information that determines, for example, which sensors are utilized and how the processor operates the module. *See* claim element 1[d]. More specifically, Ahmed discloses that each module therein "may readily be configured as any one of a large plurality of sensor types or even other types of building automation

system components … reducing the per-unit tooling and design costs associated with ordinary building automation sensors … [i]t will be noted that the design of module 600 may not only be used as the sensor modules 204, 206 in exemplary space control subsystem 200 of FIG. 2, but may also be used as the hub module 202" (Ahmed, [0098]). Thus, Ahmed explicitly discloses automation components within a building automation system in which each component may be configured, using configuration information received by the component, to perform a given subset of its possible functions and to perform in various roles required by the building automation system.

357. As previously also discussed for claim 1[d], the module within a space control subsystem of Ahmed discloses what a POSITA would recognize as a memory in communication with the microcontroller that can be used for the storage of sensor data, at least temporarily in flash memory, collected by the one or more MEMS sensors devices. A POSITA would be motivated to incorporate the energy saving approach of Kates into the configuration information of Ahmed—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of Ahmed, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. By introducing the power saving aspects of Kates into the BAS disclosed in Ahmed, specifically that in which sensor readings are evaluated against sensor value threshold criteria prior to waking up from a sleep, or otherwise transitioning from a periodic low power mode, it becomes obvious to a POSITA to identify sensor values at regular intervals and evaluate them against previously collected readings to determine anomalous conditions or changes of value during the sleep interval. In other words, generally, the approach of Kates involves the sensor unit determining whether or not to transmit sensor data based on

criteria to increase battery life by limiting transmission of data; and, it would be obvious to a POSITA that the sensor modules of Ahmed could similarly benefit in the same way by incorporating the same kind of determination of whether or not to transmit sensor data at least because the sensor modules of Ahmed contain the required processing capabilities and would benefit in the same way as the sensor units of Kates from reduced energy use.

358. In more detail, Kates discloses that "[i]n order to conserve battery power, the sensor is normally placed in a low-power mode," and "while in the low power mode, the sensor unit takes regular sensor readings and evaluates the readings to determine if an anomalous condition exists" (Kates, [0033]). In the invention of Kates, upon evaluation of the readings, "[i]f an anomalous condition is detected, then the sensor unit 'wakes up' and begins communicating with the base unit or with a repeater" (Kates, [0033]). Broadly, the power saving functionality demonstrates that the teachings of Kates allows for automation components comprising sensors to elongate battery life by only checking the values of sensors at regularly defined intervals, which occur at "programmed intervals," at which "the sensor unit 102 also 'wakes up' and sends status information (e.g., power levels, self[-]diagnostic information, etc.) to the base unit (or repeater) and then listens for commands for a period of time" (Kates, [0033]).

359. In order for the anomalous detection to be communicated from the sensor unit 102, such an anomaly must be detected, which would require the identification of sensor values when it takes readings, and an evaluation of those readings against a set of criteria that would determine if the reading was, in fact, anomalous. Kates explicitly discloses this functionality, namely that "[t]he controller 202 receives sensor data from the sensor(s) 201," and "the controller 202 evaluates the sensor data by comparing the data value to a threshold value (e.g., a high threshold, a low threshold, or a high-low threshold). If the data is outside the threshold (e.g., above a high threshold, below a

low threshold, outside an inner range threshold, or inside an outer range threshold), then the data is deemed to be anomalous and is transmitted to the base unit 112" (Kates, [0052]). A POSITA would understand that the high-low threshold "outside an inner range threshold" discloses the change-of-value threshold described in claim 3 of the '282 patent.

360. More specifically, it would be known to a POSITA that there is a finite number of threshold choices available for such an application: (1) a high threshold (i.e., above a high threshold); (2) a low threshold (i.e., below a low threshold); (3) within a range of values (i.e., outside an inner range threshold); (4) not within a range of values (i.e., inside an outer range threshold); and (5) a combination of the previous options. Moreover, a POSITA would understand that the threshold choice above could be applied to *absolute* values (i.e., fixed, predetermined thresholds) or to *relative* values (i.e., thresholds that depend on the previous or current measured values). Indeed, it is obvious to a POSITA that one criterion that grants the benefits of Kates (i.e., reduced transmission energy usage by selective determination of when to transmit data) could be implemented using a relative application of choice (4) such that data is only transmitted when a meaningful change occurs. This would, for example, increase the battery life of a temperature sensor by preventing repeated transition of the same temperature when a room's temperature is stable; because an HVAC system only needs to act when temperature changes, there is no need for a constant temperature to be repeatedly transmitted and thus the system of Kates achieves its goal of reducing transmission of data without effecting how the HVAC system operates.

361. In more detail, to effectively determine when a sensor reading has changed from that of a previous reading, it would be obvious to a POSITA that a small inner range threshold would be used. For example, if a temperature has a set point of a certain value, an inner range threshold criteria could be plus or minus one degree. Thus, if a temperature reading within a space control

subsystem is taken that falls outside of this narrow range, then the system would detect a change-of-value from the set point, and the condition would be reported to the base unit or a second automation component to maintain the system to operate as intended. As such, a POSITA would be motivated to implement the inner range threshold from Kates as a change-of-value threshold into the BAS of Ahmed. In other words, using the inner range threshold criteria within the BAS of Ahmed would send an alert if a measurement is outside a predefined range, which would be obvious to a POSITA interested in maintaining a system at particular sensor reading values while checking readings periodically, in view of Kates' emphasis on energy efficiency.

362. Thus, by programming the power saving functionality of Kates into the configuration information of the reconfigurable modules of Ahmed, a POSITA could easily program an inner range threshold by which sensor values could be detected as different from previous values of the same sensor. Consequently, for at least the reasons above, it is my opinion that Ahmed in view of Kates discloses the requirements of claim 3 of the '282 patent.

iv.Claim 6

363. Claim 6 of the '282 patent recites:

> The automation component of claim 1, wherein all of the stored sensor data is communicated at a regular interval.

364. Claim 6 of the '282 patent depends upon claim 1 therein, and includes additional limitations pertaining to periodic transmission of all stored sensor data. For at least the reasons detailed above in relation to claim 1, it is my opinion that of the combination of Ahmed with Kates discloses each and every limitation of claim 1 of the '282 patent; and, for at least the reasons below, it is my opinion that the combination of Ahmed and Kates also renders obvious the limitations added to this claim by claim 6.

365. Ahmed discloses periodic transmission of sensor data from sensor modules, e.g.: "[t]he microcontroller 212 may cause the transmission of sensor data from time-to-time as dictated by an internal counter or clock" (Ahmed, [0038]), "[n]ew sensor and/or setpoint values may be received periodically either on a schedule, or in response to requests generated by the processor 272" (Ahmed, [0075]).

366. Ahmed discloses that configuration information determine which sensor data is transmitted from each sensor module (*see* claim 1), and a POSITA would recognize that configuration such that all of the stored sensor data is transmitted is merely an application-specific design choice. For instance, if the sensor module included temperature, humidity, and occupancy sensors it would be obvious to a POSITA that all of the sensor data may be utilized by an HVAC system such that, for example, room temperature could be controlled based on humidity and occupancy—that is, lower temperatures may be desirable for higher humidity temperatures to optimize comfort, and different comfort or zoning considerations may be applied based on which rooms are occupied.

367. Consequently, for at least the reasons above, it is my opinion that claim 6 of the '282 patent is obvious to a POSITA in view of Ahmed.

v.Claim 20

368. Claim 20 of the '282 Patent recites:

> A method for providing power saving wireless communication within a building automation system, the method comprising:
>
> scanning sensor data associated with each of a plurality of sensors contained within a multi-sensor package of a first automation component;
>
> identifying changed sensor values within the sensor data;
>
> receiving a first communication from a second automation component in communication with the first automation component and the building automation system; and

communicating a portion of the identified changed sensor values associated with the first communication received from the second automation component

369. Thus, claim 20 of the ’282 patent is directed towards a method for wireless automation component within a building automation system, and includes limitations pertaining to selective communication of sensor data between different automation components within the building automation system. For at least the reasons detailed below, each and every limitation of claim 20 of the ’282 patent is obvious to a POSITA in view of the combination of Ahmed with Kates detailed in Section VI.E.i.

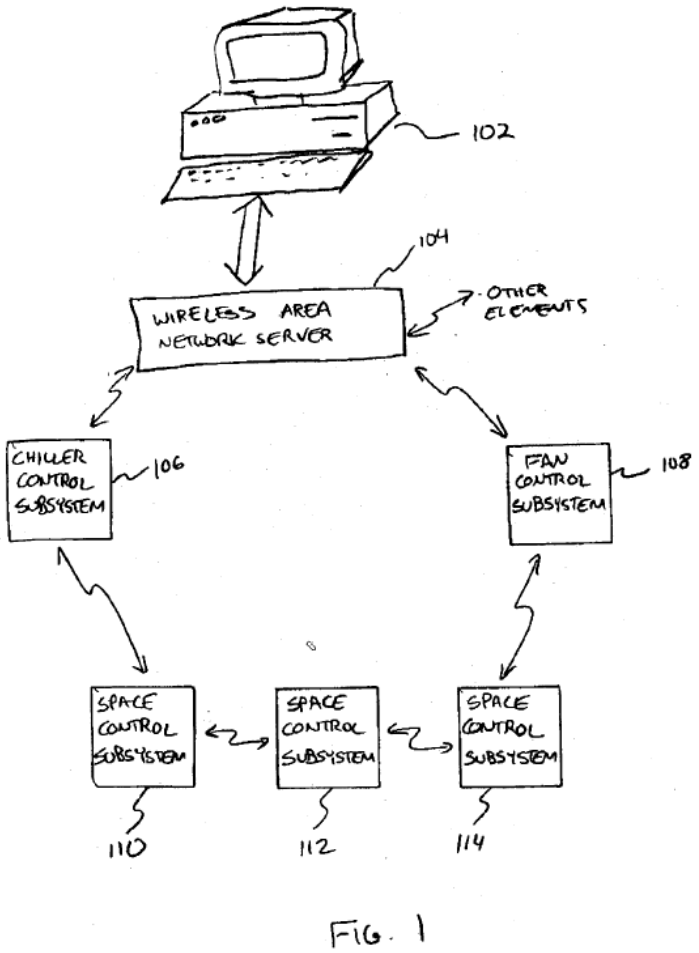
a. **20[pre] A method for providing power saving wireless communication within a building automation system, the method comprising**

370. To the extent that the preamble of claim 20 of the ’282 is limiting, Ahmed in view of Kates discloses a method incorporating power saving for an automation component configured for wireless communication within a building automation system for at least the following reasons.

371. Ahmed discloses a wireless network of automation components within a building. For example, the abstract of Ahmed describes “[a] controller arrangement for a building system” which includes “a sensor module, an actuator module, and a controller,” wherein “[t]he sensor module comprises a wireless communication devices and a microelectromechanical system device operable to generate a process … [t]he actuator module comprises an actuation element and a wireless communication device … [t]he controller is operable to obtain the process value from the sensor module and provide a control output to the actuator module, the controller further operable to communicate with at least one of the sensor module and the actuator module using a wireless communication device.” Thus, Ahmed discloses a network of sensor devices, actuator devices, and controller devices, each of which may be an automation component as required by the

preamble of claim 1 of the ’282 patent, and describes that these devices communicate wirelessly to enable actuators to be controlled based on signals from sensors.

372. More specifically, Figure 1 of Ahmed (reproduced below), shows “a block diagram of an exemplary building control system” (Ahmed, [0013]) that includes “a wireless area network server 104, a chiller controller subsystem 106, a fan controller subsystem 108, and room controller subsystems 110, 112, and 114” and Ahmed is clear that this building control system is merely an example, stating that “[t]ypical building control systems will include many more space control subsystems as well as many more chiller, fan, heater, and other building HVAC systems” (Ahmed, [0023]).



Reproduction of Ahmed figure 1.

373. Thus, Ahmed discloses a wireless area network that connects various control subsystems, where each control subsystem may be comprised of several automation components configured for wireless communication with the building control system. Indeed, in reference to "room controls 110, 112, and 114 of figure 1, Ahmed describes that these subsystems are "local controller subsystems that operate to control an environmental aspect of a location or 'space' within the building" (Ahmed, [0027]) and that "each of the space control subsystems 110, 112 and 114 has multiple elements that communicate with each other using a second wireless communication scheme such as Bluetooth" (Ahmed, [0028]).

374. Furthermore, Figure 2 of Ahmed (reproduced below) shows "a schematic block diagram of an exemplary room control system that may be used as the space control subsystems 110" (Ahmed, [0028]) that includes a "hub module 202," two "sensor modules 204 and 206," and one "actuator module 208" (Ahmed, [0029]). In an example embodiment discussed within Ahmed, the room control system of figure 2 is configured to control HVAC equipment whereby "[t]he first sensor module 204 represents a temperature sensor module and is preferable embodied as a wireless integrated network sensor" (Ahmed, [0030]), "[t]he sensor module 206 is configured to operate as a flow sensor" (Ahmed, [0044]), and "[t]he actuator module 208 … is operable to control the position of a ventilation damper, thereby controlling the flow of heated or chilled air into the room" (Ahmed, [0045]).

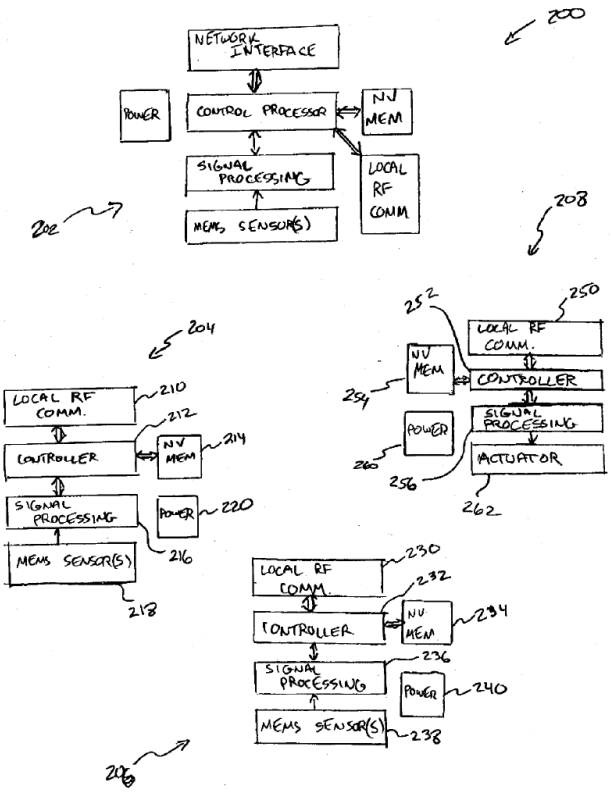


FIG. 2

Reproduction of Ahmed Figure 2.

375. Thus, each of modules 202, 204, 208, and 206 constitute example "automation components" as required by claim 20 of the '282 patent. Moreover, the hub module 202 including a "network interface" to communicate with other hub devices as well as "local RF comm" to wirelessly communicate with other modules; and modules 204, 208, and 206 also include "local RF comm" to allow wireless communication between modules; and Ahmed describes these modules as constituting parts of a building control system which function to autonomously control the environment within "spaces" or "rooms" in a building. Therefore, Ahmed discloses automation components that are configured for wireless communication within a building automation system.

376. In addition, to the extent that the preamble of claim 20 of the '282 Patent is limiting, Kates also discloses an automation component configured for wireless communication within a building automation system that also provides power saving functionality for at least the following reasons.

377. Kates discloses a wireless automation device, for example Kates describes "[a] low cost, robust, wireless sensor system that provides an extended period of operability without maintenance" (Kates, Abstract). Moreover, Kates discloses a system for autonomous monitoring of anomalous conditions which performs alarm functionality in the event that such a condition is detected (*see, e.g.*, Kates, Abstract). Kates additionally discloses "[i]n one embodiment, the sensor unit is bi-directional and configured to receive instructions from the central reporting station (or repeater). Thus, for example, the central reporting station can instruct the sensor to: perform additional measurements, go to a standby mode, wake up; report battery status, change wake-up interval, run self-diagnostics and report results, etc." (Kates, [0008]). The bi-directional, wireless sensor units of Kates which can receive and follow instructions constitutes automation components configured for wireless communication within a building automation system.

378. More specifically, as detailed in Section VI.E.i, a POSITA would be motivated to incorporate the energy saving approach of Kates—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of Ahmed, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the combination of Ahmed and Kates which a POSITA would be motivated to make includes the sensor modules of Ahmed with the power saving functionality of Kates, which, for at least the reasons detailed above, satisfy the requirements of the preamble of claim 20 of the '282 patent.

379. Consequently, for at least the reasons above, to the extent that the preamble of claim 20 of the '282 patent is limiting, it is my opinion this preamble is rendered obvious to a POSITA in view of the combination of Ahmed with Kates.

380. In addition, regarding the claim term "[first/second] automation component," to the extent that this term applies to the "an automation component" of the claim 20 preamble I have applied the Court's construction for this term in forming my opinions. More specifically, the Court has ordered that the term "[first/second] automation component" be construed to mean "[first/second] component designed to operate without human interaction in an automation system" and I have applied this construction in my analysis. The modules of Ahmed are used within a building control system to autonomously control the environment within a room of the building by operating actuator modules based on information from sensor modules, and thus operate without human interaction when performing their usual function. Similarly, the sensor units of Kates operate within an autonomous system for detecting anomalous conditions without human interaction until an alarm is triggered to potentially alert a human to the detected condition. In any event, Ahmed discloses a control subsystem consisting of temperature sensors, actuators, and controllers for controlling HVAC equipment—that is, Ahmed discloses autonomous components consistent with Ollnova's accusations, which purport that a thermostat controller and/or associated remote temperature sensors are allegedly automation components that satisfy claim 20 of the '282 patent. Similarly, Kates discloses an autonomous system in which sensor units detect temperatures that are outside of a predetermined range in order to trigger alerts for high or low temperatures. In other words, in the event that Ollnova argues that the combination of Ahmed and Kates which a POSITA would be motivated to make does not disclose the claimed autonomous components as construed by the Court, it should be noted that not only does this combination disclose automation components according to the Court's construction, but this combination satisfies Ollnova's own infringement theories, as far as these can be understood from its infringement contentions.

b. **20[a] scanning sensor data associated with each of a plurality of sensors contained within a multi-sensor package of a first automation component;**

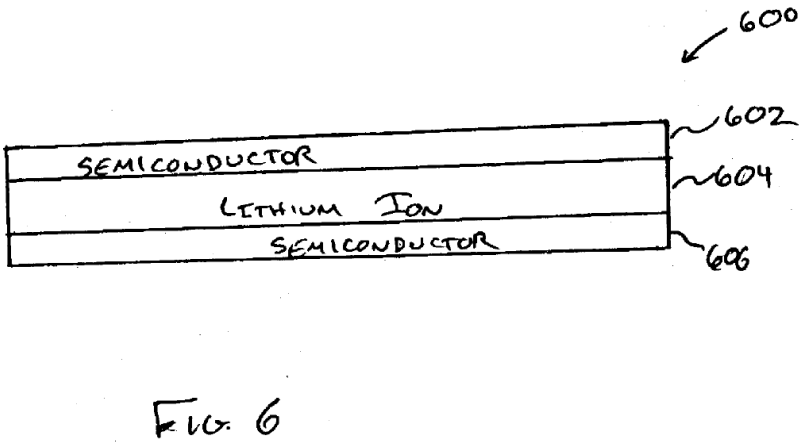
381. Ahmed discloses wireless automation components that include a multi-sensor package configured to detect a plurality of variables and scanning sensor data associated with each detected variable, for at least the following reasons.

382. As discussed in relation to the preamble of claim 20, Ahmed discloses a wireless building control system comprised of multiple "space control subsystems" networked together; where each space control subsystem is comprised of a hub that can wirelessly communicate to other subsystems as well as sensor modules and actuator modules within the local subsystem; and where each hub and module constitute an automation component of claim 1 of the '282 patent.

383. Ahmed also discloses that sensor modules can comprise multiple different sensors, each for sensing different variables, packed together into a sensor suite. More specifically, in reference to MEMS sensor module 218 within an example sensor module, Ahmed discloses that "[t]he MEMS sensor device(s) 218 include at least one MEMS sensor, which may suitably by a temperature sensor, flow sensor, pressure sensor and/or gas-specific sensor. In a preferred embodiment, several sensors are incorporated into a single device as a sensor suite 218" (Ahmed, [0032], emphasis added).

384. In yet more detail, Ahmed discloses that the several different sensors within a sensor suite may be fabricated onto a single semiconductor substrate. For instance, in relation to figure 6 (reproduced below), which shows "a side view of an exemplary wireless module" (Ahmed, [0018]) that is an example "single substate or single device solution for the sensor module 204" (Ahmed, [0031]), Ahmed states "a set of selectable sensor devices may further include, by way of example, a light sensor, a heat or smoke sensor, a movement sensor, and/or a biometric sensor … In

accordance with one aspect of the invention, several known MEMS sensing technologies are incorporated into a single substrate" (Ahmed, [0033], emphasis added).



Reproduction of Ahmed Figure 6.

385. At least because Ahmed discloses incorporating several MEMS sensors on the same semiconductor substrate and packaging this within a single sensor module, Ahmed discloses "a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detector variable." Indeed, a POSITA would recognize that integration of different sensors within a single substrate necessitates that these different sensors are packaged together, since otherwise the packaging would necessarily divide the semiconductor material into more than one substrate.

386. Ahmed further discloses that each "sensor module," "actuator module," and "controller" include "a wireless communication device" (*see* Ahmed, Abstract). For example, in general, Ahmed discloses that the controller hubs, sensor modules, and actuator modules of the building control system therein each include local radio frequency communication capabilities, labeled "local RF Comm" in Ahmed Figure 2, and discloses that "sensor module 204 includes a MEMS local RF communication circuit 210" (Ahmed, [0030]) as well as describing that these modules utilize "a short-range or local RF communication scheme such as Bluetooth" (Ahmed, [0028]).

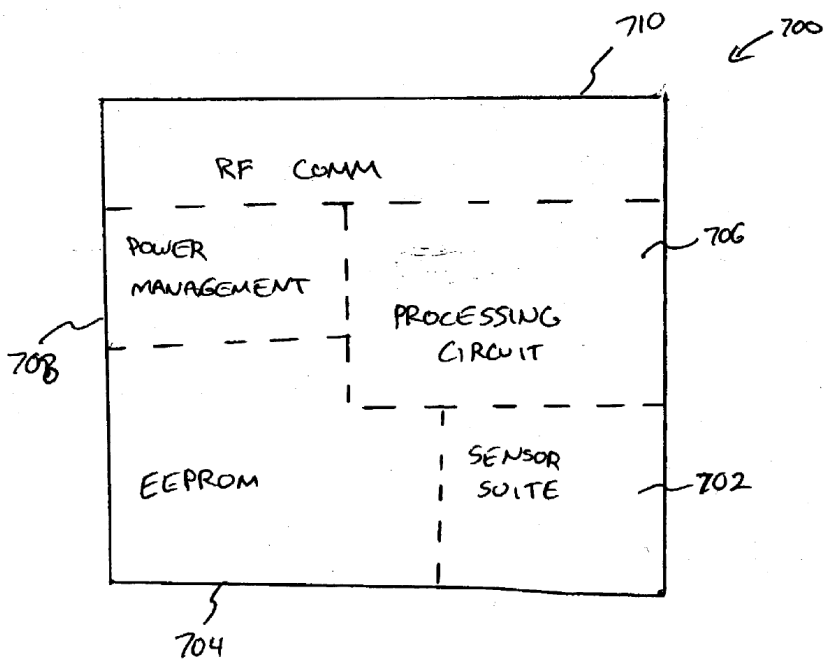


FIG. 7

Reproduction of Ahmed Figure 7.

387. More specifically, Figure 7 of Ahmed (reproduced above) shows "a block diagram of a module circuit" (Ahmed, [0019]) that includes "an RF communication circuit 710" (Ahmed, [0089]), and discloses that "[t]he RF communication circuit 710 is a MEMs based communication circuit … [and] is preferably configured to communicate using at least one local RF communication format, such as Bluetooth" (Ahmed, [0090]).

388. As detailed in relation to claim element 20[pre], the modules of the space control subsystems of Ahmed each include a multi-sensor package and a wireless communications component. In addition, Ahmed discloses that a processor is also within each module and that this processor is in communication with the wireless communications component and the sensor package. For example, Ahmed discloses, in relation to an example sensor module 204, that "sensor module 204 includes a MEMS local RF communication circuit 210, a microcontroller 212, a

programmable non-volative [*sic*] memory 214, a signal processing circuit 216, and one or more MEMS sensor devices 218" (Ahmed, [0030], emphasis added).

389. Similarly, in relation to Figure 7 therein, each "module circuit 700 include[s] a sensor suite 702, an EEPROM 704, a processing circuit 706, a power management circuit 708 and an RF communication circuit 710" (Ahmed, [0089]), wherein "[t]he processing circuit 706 preferably incorporates a microprocessor or microcontroller, as well as microelectronics A/D circuits for connecting to the MEMs sensor devices of the sensor suite 702" (Ahmed, [0093]), "the signal processing circuit 706 otherwise controls the operations of the module" (Ahmed, [0093]), "[t]he signal processing circuit 706 obtains the programming instructions from the RF communication circuit 710 and stores the instructions into the EEPROM 704" (Ahmed, [0097]) and "the processing circuit 706 is configured to generate digital or analog outputs to a wide range of actuator devices … [and] includes digital to analog and analog to digital conversion circuitry to allow both sensor input and actuator output" (Ahmed, [0099]).

390. Thus, Ahmed explicitly discloses that each module includes a processor within the processing circuit 706, and that this processor controls the operations of the module. Moreover, the processor obtains instructions from the RF communication circuit, and provides A/D conversion for sensor inputs—i.e., the processor within processing circuit 706 is in communication with both the wireless communication component (RF communication circuit) and the sensors within the sensor suite (multi-sensor package). Therefore, it would be obvious to a POSITA that the A/D conversion for sensor inputs of the sensor units of Ahmed scan sensor data associated with each of a plurality of sensors contained within a multi-sensor package of a first automation component (i.e., a sensor unit).

391. In addition, Kates discloses multiple different kinds of sensor packaged within a single sensor unit, stating in relation to example sensor units 102-106 that "[t]he sensor units 102-106 include sensors to measure conditions, such as, for example, smoke, temperature, moisture, water, water, temperature, humidity, carbon monoxide, natural gas, security alarms, intrusion alarms (e.g., open doors, broken windows, open windows, and the like), other flammable gases, radon, poison gasses, etc." and that "[d]ifferent sensor units can be configured with different sensors or with combinations of sensors" (*see* Kates, [0030], emphasis added). Thus, Kates discloses multiple different sensors within a single sensor unit.

392. Kates additionally discloses "[i]n one embodiment, the sensor unit is bi-directional and configured to receive instructions from the central reporting station (or repeater). Thus, for example, the central reporting station can instruct the sensor to: perform additional measurements, go to a standby mode, wake up; report battery status, change wake-up interval, run self-diagnostics and report results, etc." (Kates, [0008]). Moreover, Figure 2 of Kates shows that the sensor units therein include "a transceiver 203" (Kates, [0050]) The bi-directional, wireless sensor system which can receive and follow instructions constitutes a wireless automation device.

393. Kates also discloses within this wireless automation device a processor in communication with the wireless communications component and the sensor package. More specifically, in a description of figure 2 of Kates (reproduced below), Kates states "[i]n the sensor unit 102, one or more sensors 201 and a transceiver 203 are provided to a controller 202" (Kates, [0050]), where "the transceiver 203 is based on a TRF 6901 transceiver chip from Texas Instruments" (Kates, [0051]). The TRF 6901 from Texas Instruments is a single-chip RF transceiver,[7] and thus it would be clear to a POSITA that the controller 203 is in communication with a wireless communications

[7] *See* TRF6901 product page by Texas Instruments, accessed April 17, 2023. TRF6901 data sheet, product information and support | TI.com

component (i.e., transceiver 203). Thus, it would be clear to a POSITA that the controller 202 in a sensor unit of Kates would be in communication with a wireless communications component (i.e., transceiver 203) and the sensors within the sensor suite (i.e., one or more sensors 201).

394. These requirements would also be obvious to a POSITA in view of the specific combination of these references which a POSITA would be motivated to make. More specifically, as detailed in Section VI.E.i, a POSITA would be motivated to incorporate the energy saving approach of Kates—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of Ahmed, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the sensor modules of Ahmed—which include multiple different MEMS sensors packaged within the same semiconductor substrate—are included within the combination of Ahmed with Kates which a POSITA would be motivated to make, and therefore, for at least the reasons above, this combination satisfies the requirements of claim element 20[a].

395. Consequently, for at least the reasons above, it is my opinion that claim element 20[a] of the ’282 patent is rendered obvious to a POSITA in view of Ahmed in combination with Kates.

c. **20[b] identifying changed sensor values within the sensor data;**

396. The combination of Ahmed and Kates discloses identifying changed sensor values within the sensor data, for at least the following reasons.

397. As shown in figure 2 of Ahmed, each of the modules within a space control subsystem include a nonvolatile memory (labeled as “NV MEM”) in the figure. Indeed, in reference to an example embodiment, Ahmed discloses that “sensor module 204 includes a MEMS local RF communication circuit 210, a microcontroller 212, a programmable non-volitive [*sic*] memory

214, a signal processing circuit 216, and one or more MEMS sensors devices 218" (Ahmed, [0030], emphasis added). Ahmed as discloses that programmable non-volatile memory 214 "may be embodied as a flash programmable EEPROM" (Ahmed, [0036]), and figure 7 of Ahmed clearly depicts this EEPROM memory as part of the module circuitry alongside a processing circuit and sensor suite.

398. A POSITA would recognize that the EEPROM is utilized to store programing for execution by the processor, as well as information utilized by the processor, at least because embedded EEPROM memory is typically used in microprocessor systems for these purposes. In any event, Ahmed expressly discloses that the non-volatile memory of the modules is in communication with the processor by explaining, at length, that this memory contains configuration information that is utilized by the processor and that the processor can write into the memory (i.e., the memory is necessarily in communication with the processor). For example, Ahmed discloses that "[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information" (Ahmed, [0039]).

399. The storage of sensor data provided by the sensor package within the non-volatile memory of the modules is inherent in the sensor modules, since these modules convert the analog signals from embedded MEMS sensor devices into digital signals for RF transmission, which a POSITA would understand requires storage of the sensor data, at least temporarily, within a cache or other memory within the sensor module. More specifically, a POSITA would recognize that the flash EEPROM memory within a sensor module is a convenient memory in which to store sensor data after this has been derived from analog sensor data and before it has been transmitted by the RF communication system. Moreover, a POSITA would understand that such storage is required since

there is no guarantee that a transmission will occur exactly when data is acquired and thus storage of the sensor data is necessary at least until it is transmitted. This is consistent with Ahmed's explicit disclosure that "[t]he EEPROM 704 also store information related to the function in which the module 600 will be used" (Ahmed, [0094]), since a POSITA would recognize that the function of a sensor module necessarily involves obtaining sensor data and this data will necessarily need to be stored between acquisition and transmission. Indeed, Ahmed discloses that "the microcontroller 212 determines whether it is time to transmit an updated temperature value to the hub module 202 … [t]he determination of when to transmit temperature values may be driven by a clock internal to the sensor module 204, or in response to a request or query received from the hub mobile 202, or both" (Ahmed, [0077]). Therefore, a POSITA would recognize that storage of temperature values between their acquisition and subsequent transmission is required. Furthermore, the storage of sensor data within a sensor is a standard practice which would be expected by a POSITA as a normal feature in remote sensing devices required for their typical functionality.

400. In addition, Ahmed discloses that the non-volatile memory of the modules therein stored "computer readable instructions which are executable by the processor." Indeed, in general, the invention claimed within Ahmed contemplates space control subsystems utilizing multiple different sensor modules that "have the same physical construction" wherein different sensor modules contain different "configuration information" to determine which of the multiple sensors therein are used by a given sensor module and how each sensor module operates within the control subsystem (*see*, e.g., Ahmed, [0044]). More specifically, Ahmed discloses that "[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform

operations in accordance with such configuration information" (Ahmed, [0039]). More specifically, in relation to the describing how a sensor module may be configured to be a temperature sensor by programming the configuration information, Ahmed discloses that "[t]he microcontroller 212, responsive to the configuration information, causes the signal processing circuit 216 to process signals only from the temperature sensor, ignoring output from other sensors of the sensor suite 218" (Ahmed, [0041]). Moreover, Ahmed explicitly discloses that the configuration within the memory includes code required for the processor to utilize the applicable sensors for a specific purpose, stating "in one embodiment of the invention, most or all of the code unique to the selected function of the module is downloaded into the EEPROM 704 during configuration of the device … [t]hus, if the module 600 is to operate as a temperature sensor module, then all appropriate code for a temperature sensor module is downloaded to the EEPROM 704" (Ahmed, [0096]). Thus, the configuration information stored within the memory includes instructions that are executed by the processor to determine how to operate the sensor module.

401. As detailed above Ahmed discloses "configuration information" that may be wirelessly received by a module within a space control subsystem to determine how the module functions. More broadly, Ahmed contemplates a network of multiple modules, where each module is the same but may be configured to perform different functions using stored configuration information that determines, for example, which sensors are utilized and how the processor operates the module. More specifically, Ahmed discloses that each module therein "may readily be configured as any one of a large plurality of sensor types or even other types of building automation system components … reducing the per-unit tooling and design costs associated with ordinary building automation sensors … [i]t will be noted that the design of module 600 may not only be used as the sensor modules 204, 206 in exemplary space control subsystem 200 of FIG. 2, but may also be

used as the hub module 202" (Ahmed, [0098]). Thus, Ahmed explicitly discloses automation components within a building automation system in which each component may be configured, using configuration information received by the component, to perform a given subset of its possible functions and to perform in various roles required by the building automation system.

402. As previously also discussed above, the module within a space control subsystem of Ahmed discloses what a POSITA would recognize as a memory in communication with the microcontroller that can be used for the storage of sensor data, at least temporarily in flash memory, collected by the one or more MEMS sensor devices. A POSITA would be motivated to incorporate the energy saving approach of Kates into the configuration information of Ahmed—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of Ahmed, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. By introducing the power saving aspects of Kates into the BAS disclosed in Ahmed, specifically that in which sensor readings are evaluated against sensor value threshold criteria prior upon waking up from a sleep, or otherwise transitioning from a periodic low power mode, it becomes obvious to a POSITA to identify sensor values at regular intervals and evaluate them against previously collected readings to determine anomalous conditions or changes of value during the sleep interval. In other words, generally, the approach of Kates involves the sensor unit determining whether or not to transmit sensor data based on criteria to increase battery life by limiting transmission of data; and, it would be obvious to a POSITA that the sensor modules of Ahmed could similarly benefit in the same way by incorporating the same kind of determination of whether or not to transmit sensor data at least because the sensor modules

of Ahmed contain the required processing capabilities and would benefit in the same way as the sensor units of Kates from reduced energy use.

403. In more detail, Kates discloses that "[i]n order to conserve battery power, the sensor is normally placed in a low-power mode," and "while in the low power mode, the sensor unit takes regular sensor readings and evaluates the readings to determine if an anomalous condition exists." (Kates, [0033]). In the invention of Kates, upon evaluation of the readings, "[i]f an anomalous condition is detected, then the sensor unit 'wakes up' and begins communicating with the base unit or with a repeater" (Kates, [0033]). Broadly, the power saving functionality demonstrates that the teachings of Kates allows for automation components comprising sensors to elongate battery life by only checking the values of sensors at regularly defined intervals, which occur at "programmed intervals," at which "the sensor unit 102 also 'wakes up' and sends status information (e.g., power levels, self[-]diagnostic information, etc.) to the base unit (or repeater) and then listens for commands for a period of time" (Kates, [0033]).

404. In order for the anomalous detection to be communicated from the sensor unit 102, such an anomaly must be detected, which would require the identification of sensor values when it takes readings, and an evaluation of those readings against a set of criteria that would determine if the reading was, in fact, anomalous. Kates explicitly discloses this functionality, namely that "[t]he controller 202 receives sensor data from the sensor(s) 201," and "the controller 202 evaluates the sensor data by comparing the data value to a threshold value (e.g., a high threshold, a low threshold, or a high-low threshold). If the data is outside the threshold (e.g., above a high threshold, below a low threshold, outside an inner range threshold, or inside an outer range threshold), then the data is deemed to be anomalous and is transmitted to the base unit 112" (Kates, [0052]). A POSITA would understand that the high-low threshold "outside an inner range threshold" discloses a

threshold by which to determine if an identified sensor reading is changed from a previous reading described in claim element 20[b] of the ’282 patent.

405. More specifically, it would be known to a POSITA that there is a finite number of threshold choices available for such an application: (1) a high threshold (i.e., above a high threshold); (2) a low threshold (i.e., below a low threshold); (3) within a range of values (i.e., outside an inner range threshold); (4) not within a range of values (i.e., inside an outer range threshold); and (5) a combination of the previous options. Moreover, a POSITA would understand that the threshold choice above could be applied to *absolute* values (i.e., fixed, predetermined thresholds) or to *relative* values (i.e., thresholds that depend on the previous or current measured values). Indeed, it is obvious to a POSITA that one criterion that grants the benefits of Kates (i.e., reduced transmission energy usage by selective determination of when to transmit data) could be implemented using a relative application of choice (4) such that data is only transmitted when a meaningful change occurs. This would, for example, increase the battery life of a temperature sensor by preventing repeated transition of the same temperature when a room’s temperature is stable; because an HVAC system only needs to act when temperature changes, there is no need for a constant temperature to be repeatedly transmitted and thus the system of Kates achieves its goal of reducing transmission of data without effecting how the HVAC system operates.

406. In more detail, to effectively determine when a sensor reading has changed from that of a previous reading, it would be obvious to a POSITA that a small inner range threshold would be used. For example, if a temperature has a set point of a certain value, an inner range threshold criteria could be plus or minus one degree. Thus, if a temperature reading within a space control subsystem is taken that falls outside of this narrow range, then the system would detect a change-of-value from the set point, and the condition would be reported to the base unit or a second

automation component to maintain the system to operate as intended. As such, a POSITA would be motivated to implement the inner rage threshold from Kates as a change-of-value threshold into the BAS of Ahmed. In other words, using the inner range threshold criteria within the BAS of Ahmed would send an alert if a measurement is outside a predefined range, which would be obvious to a POSITA interested in maintaining a system at particular sensor reading values while checking readings periodically, in view of Kates' emphasis on energy efficiency.

407. Thus, by programming the power saving functionality of Kates into the configuration information of the reconfigurable modules of Ahmed, a POSITA could easily program an inner range threshold by which sensor values could be detected as different from previous values of the same sensor (i.e., identify changed sensor values within the sensor data). Consequently, for at least the reasons above, it is my opinion that Ahmed in view of Kates discloses the requirements of claim 20[b] of the '282 patent.

d. **20[c] receiving a first communication from a second automation component in communication with the first automation component and the building automation system; and**

408. As detailed in relation to claim 20[b], Ahmed discloses "configuration information" that may be wirelessly received by a module within a space control subsystem to determine how the module functions. More broadly, also as detailed in relation to claim element 20[b], Ahmed contemplates a network of multiple modules, where each module is the same but may be configured to perform different functions using stored configuration information that determines, for example, which sensors are utilized and how the processor operates the module. *See* claim element 20[b]. More specifically, Ahmed discloses that each module therein "may readily be configured as any one of a large plurality of sensor types or even other types of building automation system components … reducing the per-unit tooling and design costs associated with ordinary

building automation sensors … [i]t will be noted that the design of module 600 may not only be used as the sensor modules 204, 206 in exemplary space control subsystem 200 of FIG. 2, but may also be used as the hub module 202" (Ahmed, [0098]). Thus, Ahmed explicitly discloses automation components within a building automation system in which each component may be configured, using configuration information received by the component, to perform a given subset of its possible functions and to perform in various roles required by the building automation system.

409. More generally, in reference to a module, Ahmed discloses that "[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information" (Ahmed, [0039]). That is, Ahmed discloses that an automation component "receives" configuration information via its wireless communication device and that this received configuration information is stored in the memory and utilized by the processor to determine how to operate the automation component.

410. Further, the configuration information identifies which "sensor or sensor value is driving or controlling a second automation component." More specifically, Ahmed discloses that the configuration information determines which sensor or sensors are required for an automation component's function (e.g., in relation to configuring a sensor module to operate as a temperature sensor as part of an HVAC system). Ahmed discloses "the EEPROM 704 may store information identifying that module 600 should enable its temperature sensing function as opposed to any of its other possible sensing functions" (Ahmed, [0094]).

411. In more detail, Ahmed discloses that the microprocessor within a sensor module uses the configuration information "to cause the appropriate sensor device or devices from the sensor

device suite 218 to be operable connected to the signal processing circuit such that sensed signals from the appropriate sensor device are digitized and provided to the microcontroller 212 … the microcontroller 212 may also use the configuration information to format outgoing messages and/or control operation of the RF communication circuit 210" (Ahmed, [0039]). Moreover, in relation to the example embodiment where the sensor module is part of a HVAC control system, Ahmed discloses that "[t]he microcontroller 212, responsive to the configuration information, causes the signal processing circuit 216 to process signals only from the temperature sensor, ignoring output from other sensors of the sensor suite 218" (Ahmed, [0041]). Thus, Ahmed explicitly discloses that the configuration information, which is received by a module via the module's RF communication device, identifies the sensor or sensor values that the module should process and transmit.

412. Furthermore, Ahmed describes that the example space control system of Fig. 2 is a kind of HVAC system in which "sensor module 204 is configured to enable its temperature sensing function" (Ahmed, [0034]), "sensor module 206 is configured to operate as a flow sensor" (Ahmed, [0044]), "actuator module 208 … is operable to control the position of a ventilation damper, thereby controlling the flow of heated or chilled air into the room" (Ahmed, [0045]), and "hub module 202 … performs the function of the loop controller (e.g., a PID controller) for the space control subsystem 110" (Ahmed, [0051]). Thus, Ahmed discloses an example embodiment of a space control system where a temperature sensor, flow sensor, and damper actuator are coordinated via a controller to perform HVAC operations.

413. Accordingly, a POSITA would understand that the temperature sensor provides the inside temperature to the hub, which then determine whether or not adjustments to the actuator are required to enforce programmed temperature settings. Indeed, Ahmed states that hub module 202

"obtains process variable values (i.e., sensor information) from either or both of the sensor modules 204 and 206 and generates control output values," "provides the control output values to the actuator module 208," and also "communicates with external elements of the building control system, for example the supervisory computer, fan or chiller control subsystems, and other room controller subsystems" (Ahmed, [0051], *see also* Ahmed, [0061]).

414. Therefore, at least because Ahmed explicitly contemplates the use of multiple similar modules which are configured to perform a particular role by configuration information programmed into each module memory, and because the sensor modules are connected to the supervisory computer via the hub modules, each sensor module receives configuration information from a hub module to cause it to function as required by the hub. More specifically, when configuring a space control subsystem of Ahmed for its purpose, the appropriate configuration information must be transmitted to each sensor module from the hub. Indeed, in addition to manual configuration, which a POSITA would understand could be achieved via the user interface provided by the supervisory computer—which facilitates network management and coordination of communication of data and control signals (Ahmed, [0105])—Ahmed discloses that the processing circuits of modules therein "may also include inherent memory that incorporates routines for self-commissioning, self-configuring and fault diagnostics for the module 600" (Ahmed, [0099]). Thus, Ahmed discloses that a module can self-configure, which a POSITA would understand involves, for example, a controller requisitioning required sensor modules for its assigned control processes via distributing corresponding configuration information.

415. Consequently, for at least the reasons above, the configuration information of Ahmed is received by sensor modules within space control subsystems from hub modules within the same building control system, and this configuration information is used by the sensor modules to

identify which sensor values are required to be transmitted to the hub module. Accordingly, the modules of Ahmed perform a step of "receiving a first communication from a second automation component in communication with the first automation component and the building automation system," and it is my opinion that Ahmed discloses the requirements of claim element 20[c] of the '282 patent.

416. In addition to Ahmed individually disclosing the requirements of claim element 20[c] of the '282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of Ahmed with Kates which a POSITA would be motivated to make. More specifically, as detailed in Section VI.E.i, a POSITA would be motivated to incorporate the energy saving approach of Kates—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of Ahmed, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the combination of Ahmed with Kates which a POSITA would be motivated to make includes the reconfigurable modules of Ahmed which utilize "configuration information" in a way that satisfies the limitations of claim element 20[c], and therefore, for at least the reasons above, this combination satisfies the requirements of claim element 20[c].

e. **20[d] communicating a portion of the identified changed sensor values associated with the first communication received from the second automation component.**

417. For at least the reasons detailed in relation to claim element 20[c], a sensor module of Ahmed (i.e., an example "automation component") communicates a portion of the identified changed sensor values associated with the first communication received from a controller hub (i.e., an example "second automation component") within the same building automation system. More

specifically, as detailed in relation to previous claim elements of claim 20, each sensor module within a space control subsystem of the building automation system of Ahmed receives "configuration information," which may be wirelessly transmitted to each sensor module from a controller hub; this configuration information is used by each sensor module to identify which of several different kinds of available sensor data is needed by the hub for the hub's control processes, and the corresponding sensor data, including changes of sensor values as discussed in claim element 20[b] by incorporating the power saving functionality of Kates, is transmitted to the controller hub.

418. Consequently, for at least the reasons above, it is my opinion that Ahmed discloses the requirements of claim element 20[d] of the '282 patent.

419. In addition to Ahmed individually disclosing the requirements of claim element 20[d] of the '282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of Ahmed with Kates which a POSITA would be motivated to make. More specifically, as detailed in Section VI.E.i, a POSITA would be motivated to incorporate the energy saving approach of Kates—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of Ahmed, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the combination of Ahmed with Kates which a POSITA would be motivated to make includes the reconfigurable modules of Ahmed which utilize "configuration information" to identify which sensor values should be communicated as required by claim element 20[d], and therefore, for at least the reasons above, this combination satisfies the requirements of claim element 20[d].

vi.Claim 21

420. Claim 21 of the '282 patent recites:

> The method of claim 20, wherein identifying changed sensor values includes identifying changed sensor values as a function of a change-of-value threshold.

421. Claim 21 of the ’282 patent depends upon claim 20 therein, and includes additional limitations pertaining to the identification of sensor values that exceeds a change-of-value threshold. For at least the reasons detailed above in relation to claim 20, it is my opinion that the combination of Ahmed with Kates discloses each and every limitation of claim 20 of the ’282 patent; and, for at least the reasons below, it is my opinion that the combination of Ahmed and Kates also renders obvious the limitations added to this claim by claim 21.

422. As previously discussed for claim element 20[b], the combination of Ahmed and Kates makes it obvious to a POSITA that in order for the anomalous detection to be communicated from the sensor unit 102, such an anomaly must be detected, which would require the identification of sensor values when it takes readings, and an evaluation of those readings against a set of criteria that would determine if the reading was, in fact, anomalous. Kates explicitly discloses this functionality, namely that “[t]he controller 202 receives sensor data from the sensor(s) 201,” and “the controller 202 evaluates the sensor data by comparing the data value to a threshold value (e.g., a high threshold, a low threshold, or a high-low threshold). If the data is outside the threshold (e.g., above a high threshold, below a low threshold, outside an inner range threshold, or inside an outer range threshold), then the data is deemed to be anomalous and is transmitted to the base unit 112” (Kates, [0052]). A POSITA would understand that the high-low threshold “outside an inner range threshold” discloses the change-of-value threshold described in claim 3 of the ’282 patent.

423. More specifically, it would be known to a POSITA that there is a finite number of threshold choices available for such an application: (1) a high threshold (i.e., above a high threshold); (2) a low threshold (i.e., below a low threshold); (3) within a range of values (i.e., outside an inner range

threshold); (4) not within a range of values (i.e., inside an outer range threshold); and (5) a combination of the previous options. Moreover, a POSITA would understand that the threshold choice above could be applied to *absolute* values (i.e., fixed, predetermined thresholds) or to *relative* values (i.e., thresholds that depend on the previous or current measured values). Indeed, it is obvious to a POSITA that one criterion that grants the benefits of Kates (i.e., reduced transmission energy usage by selective determination of when to transmit data) could be implemented using a relative application of choice (4) such that data is only transmitted when a meaningful change occurs. This would, for example, increase the battery life of a temperature sensor by preventing repeated transition of the same temperature when a room's temperature is stable; because an HVAC system only needs to act when temperature changes, there is no need for a constant temperature to be repeatedly transmitted and thus the system of Kates achieves its goal of reducing transmission of data without effecting how the HVAC system operates.

424. In more detail, to effectively determine when a sensor reading has changed from that of a previous reading, it would be obvious to a POSITA that a small inner range threshold would be used. For example, if a temperature has a set point of a certain value, an inner range threshold criteria could be plus or minus one degree. Thus, if a temperature reading within a space control subsystem is taken that falls outside of this narrow range, then the system would detect a change-of-value from the set point, and the condition would be reported to the base unit or a second automation component to maintain the system to operate as intended. As such, a POSITA would be motivated to implement the inner rage threshold from Kates as a change-of-value threshold into the BAS of Ahmed. In other words, using the inner range threshold criteria within the BAS of Ahmed would send an alert if a measurement is outside a predefined range, which would be

obvious to a POSITA interested in maintaining a system at particular sensor reading values while checking readings periodically, in view of Kates' emphasis on energy efficiency.

425. Further, as discussed for claim element 20[b], Ahmed discloses that "sensor module 204 includes a MEMS local RF communication circuit 210, a microcontroller 212, a programmable non-volitive [*sic*] memory 214, a signal processing circuit 216, and one or more MEMS sensors devices 218" (Ahmed, [0030], emphasis added). As such, it would be obvious to a POSITA to program a change-of-value threshold into the "configuration information" of the sensor module to identify changes in sensor values.

426. Thus, by programming the power saving functionality of Kates into the configuration information of the reconfigurable modules of Ahmed, a POSITA could easily program an inner range threshold by which sensor values could be detected as different from previous values of the same sensor; and the sensor module would then be able to identify changes to sensor values as a function of a change-of-value threshold. Consequently, for at least the reasons above, it is my opinion that Ahmed in view of Kates discloses the requirements of claim 21 of the '282 patent.

F. Claims 1, 3, 6, 20, and 21 of the '282 Patent are anticipated or obvious to a POSITA in view of McFarland in combination with Kates

i. Motivation to combine McFarland with Kates

427. It is my opinion that a POSITA looking to the teachings of McFarland would have additionally looked to the teachings of Kates and been motivated to combine these prior art references for the reasons detailed below, and by doing so, would have arrived independently at a system that satisfies each and every limitation of asserted Claims 1, 3, 6, 20, and 21 of the '282 Patent.

428. As detailed in Section V, McFarland—including the disclosures of Ahmed '849, which are expressly incorporated by reference therein—and Kates are both directed to systems comprising

wireless networks of components for monitoring and/or control of environmental conditions in a building. Furthermore, McFarland, Ahmed ’849, and Kates each disclose sensor components positioned in a building with the capability of wirelessly communicating information with a management processor or base unit through an intermediate component, and each reference discloses that applications of their respective systems include, for example, fire safety. All of these references even disclose some of the same wireless communication protocols for transmitting and/or receiving the sensor signals (e.g., Bluetooth), and all of these references contemplate issues relating to power resource needs of different components, particularly where low power devices or components are used. Thus, McFarland and Kates are within the same field of endeavor and present similar systems to be used in similar applications.

429. As detailed in the discussion of McFarland in Section VI.D, the limitations of claims 1 and 6 are disclosed or suggested to a POSITA by McFarland and/or Ahmed ’849, which McFarland incorporates by reference. However, Kates further expressly discloses or suggests to a POSITA aspects of those and additional claims 3, 20, and 21 of the ’282 patent, including power saving functionality and the identification of changes of value within communicated sensor data when implemented into the system components of McFarland and Ahmed ’849, which is expressly disclosed by McFarland, as detailed in Section V.B.

430. McFarland discloses an architecture for a wireless building automation system that involves two “levels” or “tiers” of network. The disclosed network architecture comprises a “first wireless network” operable to enable direct communication between individual sensors and actuators which function independently as sensor-actuator groups to set their output state based on local sensor readings without coordinated control oversight from a controller. The disclosed network architecture further comprises a more-complex “second wireless network” operable to

receive sensor output data and communicate with actuators while additionally capable of overriding the control activities of the first network, thereby imposing regional control that supersedes local sensor-actuator operation (*see*, e.g., McFarland, [0006]). McFarland teaches that building automation components may be used with different properties depending on which network in which they are included, such that components in the first network may have different frequencies and communication protocols, different power requirements, and different communication ranges (*see*, e.g., McFarland, [0029]-[0031], [0034], [0036]-[0040]), compared to those in the second network.

431. Ahmed ’849, and thus McFarland, discloses “a building control system that incorporates wireless communications and/or microelectromechanical (‘MEMs’) technology” (Ahmed ’849, [0009]). Ahmed ’849 teaches that benefits of its system include reduced wiring requirements and reduce power consumption, including when battery operated modules are used (Ahmed ’849, [0048]-[0051], [0191]). In addition, Ahmed ’849 contemplates space control subsystems utilizing multiple different sensor modules that may contain different “configuration information” to determine which of the multiple sensors therein are used by a given sensor module and how each sensor module operates within the control subsystem (*see*, e.g., Ahmed ’849, [0047]-[0052]). More specifically, Ahmed ’849 discloses that “[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information” (Ahmed ’849, [0047]), for example, “caus[ing] the signal processing circuit 216 to process signals only from the temperature sensor, ignoring output from other sensors of the sensor suite 218” (Ahmed ’849, [0049]). Moreover, Ahmed ’849 discloses the configuration information stored

within the memory includes instructions that are executed by the processor to determine how to operate the sensor module (see, e.g., Ahmed '849, [0011]).

432. Kates discloses a wireless automation device, for example Kates describes "[a] low cost, robust, wireless sensor system that provides an extended period of operability without maintenance" (Kates, Abstract). Moreover, Kates discloses a system for autonomous monitoring of anomalous conditions which performs alarm functionality in the event that such a condition is detected (*see,* e.g., Kates, Abstract). Kates describes embodiments comprising bi-directional, wireless sensor units which can receive and follow instructions (*see*, e.g., Kates, [0008]). Kates elaborates on techniques and methods to employ power saving functionality within these well-known building automation systems with detailed examples of algorithms for further reducing power consumption to maximize the length of operation of automation components.

433. In view of McFarland and Ahmed '849's respective approaches to lower power consumption requirements of a building automation system, a POSITA would be motivated to look to Kates to leverage its additional power saving methods within the system of McFarland. More specifically, Kates discloses that "[i]n order to conserve battery power, the sensor is normally placed in a low-power mode," and "while in the low power mode, the sensor unit takes regular sensor readings and evaluates the readings to determine if an anomalous condition exists." (Kates, [0033]). In the invention of Kates, upon evaluation of the readings, "[i]f an anomalous condition is detected, then the sensor unit 'wakes up' and begins communicating with the base unit or with a repeater" (Kates, [0033]). Broadly, this power saving functionality demonstrates that the teachings of Kates allows for automation components comprising sensors to elongate battery life by only checking the values of sensors at regularly defined intervals, which occur at "programmed intervals," at which "the sensor unit 102 also 'wakes up' and sends status information (e.g., power

levels, self[-]diagnostic information, etc.) to the base unit (or repeater) and then listens for commands for a period of time" (Kates, [0033]).

434. A POSITA would be motivated to incorporate the energy saving approach of Kates—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of Ahmed '849 in the two-tiered wireless network architecture of McFarland—in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems. That is, the combination of McFarland and Kates which a POSITA would be motivated to make includes the sensor modules of Ahmed '849 utilized within the first wireless network of McFarland—comprising, for example, battery powered components communicating over short distances—employing the power-conserving communication logic disclosed by Kates

435. Moreover, a POSITA would have recognized that the disclosures of McFarland (and Ahmed '849) and Kates are compatible with each other and would have been able to implement the above-described combination without undue experimentation to achieve predictable results. That is, the specific combination of McFarland and Kates that a POSITA would have been motivated to make could be employed with the physical architecture disclosed by McFarland and Ahmed '849, and thus would not have required significant design changes or further engineering. Rather, the combination would have only required a POSITA to implement the logical communication sequencing disclosed by Kates on the existing system of Ahmed '849. I note that Kates was not before the examiner during prosecution of the application that issued as the '282 patent.

436. Thus, for reasons described above as well as those discussed in the claim-by-claim analysis below, it is my opinion that a POSITA have been motivated to combine McFarland and Kates to arrive at the specific combination of these prior art references detailed above.

ii.Claim 1

437. Claim 1 of the ’282 Patent recites:

> An automation component configured for wireless communication within a building automation system, the automation component comprising:
>
> a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable;
>
> a wireless communications component;
>
> a processor in communication with the wireless communications component and the sensor package;
>
> a memory in communication with the processor, the memory configured to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor; wherein the computer readable instructions are programmed to:
>
> receive sensor control information related to sensor data in control at a second automation component in communication with the building automation system; and
>
> communicate a portion of the stored sensor data corresponding to the received sensor control information to the second automation component.

438. Thus, claim 1 of the ’282 patent is directed towards a wireless automation component within a building automation system, and includes limitations pertaining to selective communication of sensor data between different automation components within the building automation system. For at least the reasons detailed below, each and every limitation of claim 1 of

the ’282 patent is obvious to a POSITA in view of the combination of McFarland with Kates detailed in Section VI.F.i.

a. **1[pre] An automation component configured for wireless communication within a building automation system, the automation component comprising:**

439. For at least the reasons detailed in relation to VI.D.i.a, and to the extent that the preamble is found to be limiting, McFarland (including in view of the disclosure of Ahmed ’849 expressly incorporated into McFarland) satisfies this limitation.

440. In addition, for at least the reasons detailed in relation to VI.E.ii.a, and to the extent that the preamble of claim 1 of the ’282 Patent is limiting, Kates also satisfies this limitation, and therefore the combination of McFarland and Kates satisfies this limitation

b. **1[a] a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable;**

441. For at least the reasons detailed in relation to VI.D.i.b, McFarland (including in view of the disclosure of Ahmed ’849 expressly incorporated into McFarland) satisfies this limitation.

442. In addition, for at least the reasons detailed in relation to VI.E.ii.b, Kates also satisfies this limitation, and therefore the combination of McFarland and Kates satisfies this limitation.

c. **1[b] a wireless communications component;**

443. For at least the reasons detailed in relation to VI.D.i.c, McFarland (including in view of the disclosure of Ahmed ’849 expressly incorporated into McFarland) satisfies this limitation.

444. In addition, for at least the reasons detailed in relation to VI.E.ii.c, Kates also satisfies this limitation, and therefore the combination of McFarland and Kates satisfies this limitation.

d. **1[c] a processor in communication with the wireless communications component and the sensor package;**

445. For at least the reasons detailed in relation to VI.D.i.d, McFarland (including in view of the disclosure of Ahmed ’849 expressly incorporated into McFarland) satisfies this limitation.

446. In addition, For at least the reasons detailed in relation to VI.E.ii.d, Kates also satisfies this limitation, and therefore the combination of McFarland and Kates satisfies this limitation.

e. **1[d] a memory in communication with the processor, the memory configured to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor; wherein the computer readable instructions are programmed to:**

447. For at least the reasons detailed in relation to VI.D.i.e, McFarland (including in view of the disclosure of Ahmed ’849 expressly incorporated into McFarland) satisfies this limitation.

448. In addition, For at least the reasons detailed in relation to VI.E.ii.e, Kates also satisfies this limitation, and therefore the combination of McFarland and Kates satisfies this limitation.

f. **1[e] receive sensor control information related to sensor data in control at a second automation component in communication with the building automation system; and**

449. For at least the reasons detailed in relation to VI.D.i.f, McFarland (including in view of the disclosure of Ahmed ’849 expressly incorporated into McFarland) satisfies this limitation. Further, for at least the reasons detailed in relation to VI.E.ii.f and VI.F.i., the combination of McFarland and Kates also satisfies this limitation.

g. **1[f] communicate a portion of the stored sensor data corresponding to the received sensor control information to the second automation component.**

450. For at least the reasons detailed in relation to VI.D.i.g, and to the extent that the preamble is found to be limiting, McFarland (including in view of the disclosure of Ahmed ’849 expressly incorporated into McFarland) satisfies this limitation. Further, for at least the reasons detailed in relation to VI.E.ii.g and VI.F.i., the combination of McFarland and Kates also satisfies this limitation.

iii. Claim 3

451. Claim 3 of the ’282 patent recites:

> The automation component of claim 1, wherein the computer readable instructions are further programmed to: identify sensor values within the sensor data that exceed a corresponding change-of-value threshold.

452. For at least the reasons detailed above in relation to claim 1, it is my opinion that the combination of McFarland with Kates discloses each and every limitation of claim 1 of the ’282 patent; and, for at least the reasons below, it is my opinion that the combination of McFarland and Kates also renders obvious the limitations added to this claim by claim 3.

453. As detailed in relation to claim 1[d], McFarland discloses control information that may be wirelessly received by a sensor arrangement within a building automated control system to determine how the sensor arrangement functions. More broadly, also as detailed in relation to claim element 1[d], McFarland contemplates a network of multiple wireless components (e.g., sensors and actuators), where each component contains similar hardware and may be configured to perform different functions using stored configuration information that determines, for example, which sensors are utilized and how the processor operates the module. More specifically, Ahmed discloses that “[f]or example, a control algorithm is distributed on both a sensor processor 32 and an actuator processor 38 for performing a single or multiple functions,” where “[t]he portion of the control algorithm corresponding to a specific device 16, 18, 20 is then operated or implemented at the specific device without the need of further control” (McFarland, [0043]). In this regard, “[t]he control algorithm for the temperature function with in [*sic*] the room is distributed on the different sensor arrangement 16 and actuator arrangements 20,” and “[t]he sensor arrangement 16 in this corresponding control algorithm outputs information specific to the sensing function without information indicating an act to be performed” (McFarland, [0043]). Thus, McFarland explicitly discloses automation components within a building automation system in which each component may be configured, using configuration information received by the

component, to perform a given subset of its possible functions and to perform in various roles required by the building automation system.

454. Furthermore, Ahmed ’849, whose disclosure is expressly incorporated into McFarland by reference, discloses “configuration information” that may be wirelessly received by a module within a space control subsystem to determine how the module functions. More broadly, also as detailed in relation to claim element 1[d], Ahmed ’849 contemplates a network of multiple modules, where each module is the same but may be configured to perform different functions using stored configuration information that determines, for example, which sensors are utilized and how the processor operates the module. More specifically, Ahmed ’849 discloses that each module therein “may readily be configured as any one of a large plurality of sensor types or even other types of building automation system components … reducing the per-unit tooling and design costs associated with ordinary building automation sensors … [i]t will be noted that the design of module 600 may not only be used as the sensor modules 204, 206 in exemplary space control subsystem 200 of FIG. 2, but may also be used as the hub module 202” (Ahmed ’849, [0113]). Thus, Ahmed ’849 explicitly discloses automation components within a building automation system in which each component may be configured, using configuration information received by the component, to perform a given subset of its possible functions and to perform in various roles required by the building automation system.

455. As previously also discussed for claim 1[d], the sensor arrangement disclosed in McFarland discloses what a POSITA would recognize as a memory in communication with the processor that can be used for the storage of sensor data collected by the sensors disclosed in Ahmed ’849. McFarland also discloses that its design is intended to achieve energy savings, including with respect to performing tasks only when necessary (*see*, e.g., McFarland, [0009], [0086], [0191]).

Furthermore, the module within a space control subsystem of Ahmed ’849 discloses what a POSITA would recognize as a memory in communication with the microcontroller that can be used for the storage of sensor data, at least temporarily in flash memory, collected by the one or more MEMS sensors devices. A POSITA would be motivated to incorporate the energy saving approach of Kates into the control information of McFarland, and the configuration information of Ahmed ’849—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. By introducing the power saving aspects of Kates into the BAS disclosed in McFarland and Ahmed ’849, specifically that in which sensor readings are evaluated against sensor value threshold criteria prior upon waking up from a sleep, or otherwise transitioning from a periodic low power mode, it becomes obvious to a POSITA to identify sensor values at regular intervals and evaluate them against previously collected readings to determine anomalous conditions or changes of value during the sleep interval. Indeed, McFarland itself recognizes energy savings that can be gained by intermittently energizing circuitry as needed (*see* McFarland, [0086]). In other words, generally, the approach of Kates involves the sensor unit determining whether or not to transmit sensor data based on criteria to increase battery life by limiting transmission of data; and, it would be obvious to a POSITA that the sensor modules of McFarland and Ahmed ’849 could similarly benefit in the same way by incorporating the same kind of determination of whether or not to transmit sensor data at least because the sensor modules of McFarland and Ahmed ’849 contain the required processing capabilities and would benefit in the same way as the sensor units of Kates from reduced energy use.

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456. In more detail, Kates discloses that "[i]n order to conserve battery power, the sensor is normally placed in a low-power mode," and "while in the low power mode, the sensor unit takes regular sensor readings and evaluates the readings to determine if an anomalous condition exists" (Kates, [0033]). In the invention of Kates, upon evaluation of the readings, "[i]f an anomalous condition is detected, then the sensor unit 'wakes up' and begins communicating with the base unit or with a repeater" (Kates, [0033]). Generally, the power saving functionality demonstrates that the teachings of Kates allows for automation components comprising sensors to elongate battery life by only checking the values of sensors at regularly defined intervals, which occur at "programmed intervals," at which "the sensor unit 102 also 'wakes up' and sends status information (e.g., power levels, self[-]diagnostic information, etc.) to the base unit (or repeater) and then listens for commands for a period of time" (Kates, [0033]).

457. In order for the anomalous detection to be communicated from the sensor unit 102, such an anomaly must be detected, which would require the identification of sensor values when it takes readings, and an evaluation of those readings against a set of criteria that would determine if the reading was, in fact, anomalous. Kates explicitly discloses this functionality, namely that "[t]he controller 202 receives sensor data from the sensor(s) 201," and "the controller 202 evaluates the sensor data by comparing the data value to a threshold value (e.g., a high threshold, a low threshold, or a high-low threshold). If the data is outside the threshold (e.g., above a high threshold, below a low threshold, outside an inner range threshold, or inside an outer range threshold), then the data is deemed to be anomalous and is transmitted to the base unit 112" (Kates, [0052]). A POSITA would understand that the high-low threshold "outside an inner range threshold" discloses the change-of-value threshold described in claim 3 of the '282 patent.

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458. More specifically, it would be known to a POSITA that there are a finite number of threshold choices available for such an application: (1) a high threshold (i.e., above a high threshold); (2) a low threshold (i.e., below a low threshold); (3) within a range of values (i.e., outside an inner range threshold); (4) not within a range of values (i.e., inside an outer range threshold); and (5) a combination of the previous options. Moreover, a POSITA would understand that the threshold choice above could be applied to *absolute* values—i.e., fixed, predetermined thresholds—or to *relative* values—i.e., thresholds that depend on the previous or current measured values. Indeed, it is obvious to a POSITA that one criterion that grants the benefits of Kates—i.e., reduced transmission energy usage by selective determination of when to transmit data—could be implemented using a relative application of choice (4) such that data is only transmitted when a meaningful change occurs. This would, for example, increase the battery life of a temperature sensor by preventing repeated transition of the same temperature when a room's temperature is stable; because an HVAC system only needs to act when temperature changes, there is no need for a constant temperature to be repeatedly transmitted and thus the system of Kates achieves its goal of reducing transmission of data without effecting how the HVAC system operates.

459. In more detail, to effectively determine when a sensor reading has changed from that of a previous reading, it would be obvious to a POSITA that a small inner range threshold would be used. For example, if a temperature has a set point of a certain value, an inner range threshold criteria could be plus or minus one degree. Thus, if a temperature reading within a space control subsystem is taken that falls outside of this narrow range, then the system would detect a change-of-value from the set point, and the condition would be reported to the base unit or a second automation component to maintain the system to operate as intended. As such, a POSITA would be motivated to implement the inner rage threshold from Kates as a change-of-value threshold into

the BAS of McFarland and Ahmed ’849. In other words, using the inner range threshold criteria within the BAS of McFarland and Ahmed ’849 would send an alert if a measurement is outside a predefined range, which would be obvious to a POSITA interested in maintaining a system at particular sensor reading values while checking readings periodically, in view of Kates’ emphasis on energy efficiency.

460. Thus, by programming the power saving functionality of Kates into the configuration information of the reconfigurable modules of McFarland and Ahmed ’849, a POSITA could easily program an inner range threshold by which sensor values could be detected as different from previous values of the same sensor. Consequently, for at least the reasons above, it is my opinion that McFarland in view of Kates discloses the requirements of claim 3 of the ’282 patent.

iv.Claim 6

461. Claim 6 of the ’282 Patent recites:

> The automation component of claim 1, wherein all of the stored sensor data is communicated at a regular interval.

462. Claim 6 of the ’282 depends upon claim 1 therein, and includes additional limitations pertaining to periodic transmission of all stored sensor data. For at least the reasons detailed above in relation to claim 1, it is my opinion that of the combination of McFarland with Kates discloses each and every limitation of claim 1 of the ’282 patent; and, for at least the reasons below, it is my opinion that the combination of McFarland and Kates also renders obvious the limitations added to this claim by claim 6.

463. As discussed in VI.D.ii, McFarland discloses that sensor data stored in one or more sensor arrangements may be transmitted at set times. And, as discussed in VI.D.ii, Ahmed ’849 discloses periodic transmission of sensor data from sensor modules. Both McFarland and Ahmed ’849 disclose that information (e.g., “control” or “configuration” information) determine which sensor

data is transmitted from each sensor module (*see* claim 1), and a POSITA would recognize that configuration such that all of the stored sensor data is transmitted is merely an application-specific design choice. For instance, if the sensor module included, e.g., temperature, humidity, and occupancy sensors it would be obvious to a POSITA that all of the sensor data may be utilized by an HVAC system such that, for example, room temperature could be controlled based on humidity and occupancy—e.g., lower temperatures may be desirable for higher humidity temperatures to optimize comfort, and different comfort or zoning considerations may be applied based on which rooms are occupied.

464. Consequently, for at least the reasons above, it is my opinion that claim 6 of the ’282 patent is obvious to a POSITA in view of McFarland.

v.Claim 20

465. Claim 20 of the ’282 Patent recites:

> A method for providing power saving wireless communication within a building automation system, the method comprising:
>
> scanning sensor data associated with each of a plurality of sensors contained within a multi-sensor package of a first automation component;
>
> identifying changed sensor values within the sensor data;
>
> receiving a first communication from a second automation component in communication with the first automation component and the building automation system; and
>
> communicating a portion of the identified changed sensor values associated with the first communication received from the second automation component.

466. Thus, claim 20 of the ’282 patent is directed towards a method for wireless automation component within a building automation system, and includes limitations pertaining to selective communication of sensor data between different automation components within the building

automation system. For at least the reasons detailed below, each and every limitation of claim 20 of the ’282 patent is obvious to a POSITA in view of the combination of McFarland with Kates detailed in Section VI.F.i.

a. **20[pre] A method for providing power saving wireless communication within a building automation system, the method comprising:**

467. To the extent that the preamble of claim 20 of the ’282 is limiting, McFarland in view of Kates discloses a method incorporating power saving for an automation component configured for wireless communication within a building automation system for at least the following reasons.

468. McFarland discloses a system comprising a “lower level network” and a “high level network,” comprising wireless communications networks, (McFarland, [0028]), which includes components configured for wireless communication equipped to control building automation. With respect to Figure 1, McFarland states “[o]ne of the wireless networks 12 is a high level control network, and the other wireless network 14 is a lower level operations network.” More specifically, McFarland discloses, with respect to Figure 1 shown therein, a block diagram of a multi-tier wireless building automation control system architecture (McFarland, [0019]), including sensor arrangements (16) configured for communication with actuator arrangements (20), and controller (22), each of which constitute wireless automation components configured for wireless communication within a building automation system. (*see*, e.g., McFarland at Abstract; [0002]-[0004], [0006], [0010], [0026]). McFarland states in its Abstract, for example, that “[o]n a first level of the wireless building automation architecture, sensors and associated actuators communicate directly,” where “[t]he sensor performs control processes appropriate for the sensor and regardless of the type of actuator being used,” and “[t]he actuator performs control processes specific to the actuator regardless of the type of sensor being used” (McFarland at Abstract). In particular, McFarland explains

> [t]he sensor reports information appropriate or specific to the sensor, such as reporting the result of a comparison of a measured value to a desired or set point value. Actuators use the output sensor data to provide a response appropriate for the actuator. Controllers monitor the process or action of sensors and actuators without control in one mode of operation. In another mode of operation, the controllers override the sensor and/or actuators to alter processing based on a regional or larger area control process (McFarland, [0031], see also, e.g., [0050]-[0054]; [0056]-[0057]).

469. Figure 1 and Figure 5 of McFarland, reproduced below, illustrate exemplary arrangements of automation components of the disclosed system in a building automation system.

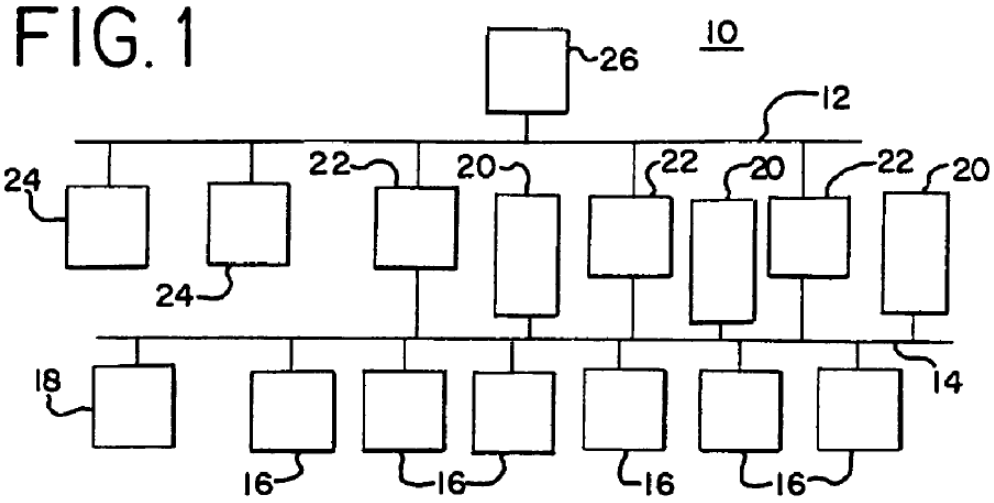


Figure 1. Reproduction of McFarland figure 1.

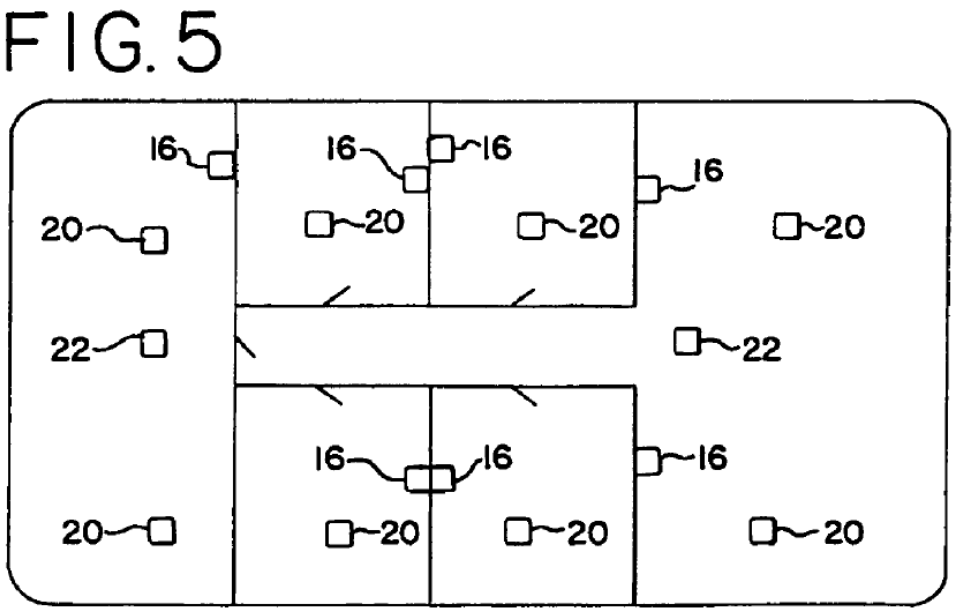


Figure 2. Reproduction of McFarland figure 5.

470. Figures 2, 3 and 4 of McFarland shows block diagrams of exemplary automation components (sensor arrangement, actuator arrangement, controller) that wirelessly communicate and operate within its disclosed system:

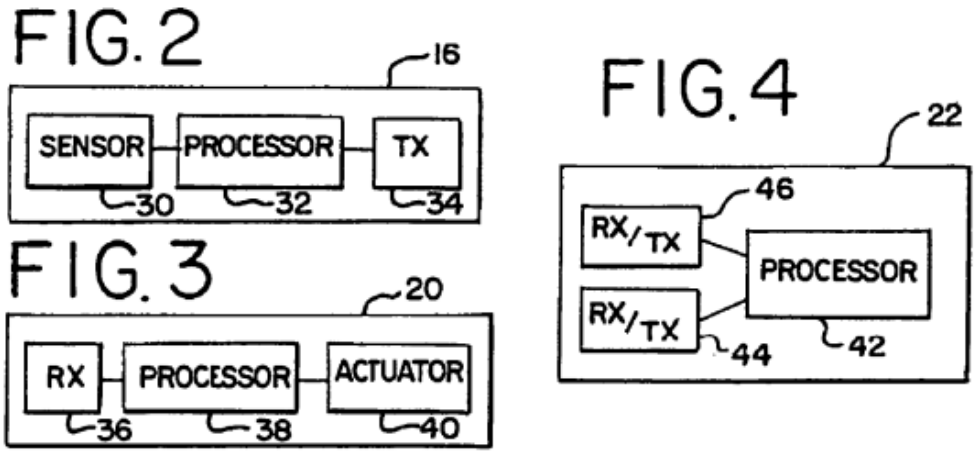


Figure 3. Reproduction of McFarland figures 2, 3 and 4.

471. McFarland discloses that such sensor, actuators, and controllers may each include processors as well as transceivers for transmitting and/or receiving wireless communications signals. For example, McFarland explains that sensor arrangement 16 "includes a sensor 30, a sensor processor 32 and a transmitter 34," where "transmitter 34 is a radio frequency transmitter"

(McFarland, [0034], [0037]). McFarland further explains that actuator arrangement 20 "includes a receiver 36, an actuator processor 38 and an actuator 40," where "receiver 36 is a radio frequency receiver" (McFarland, [0038]-[0039]). McFarland further explains that controller 22 "include one or more processors 42 and two transceivers 44, 46," where "[o]ne transceiver 44 is operable for connecting with the lower level network 14," and "transceiver 46 is operable to transmit and receive information to and from other controllers 22, or other devices 24 and 26 of the high level wireless network 12" (McFarland, [0052]-[0054]).

472. McFarland discloses that "in one embodiment, sensor arrangements 16, other devices 18 and/or the actuator arrangements 20 operate as full function devices of 802.15.4 allowing for dynamically assigned communications with different devices over a single or multiple communications path but without the ability to route routing communications from other devices." (McFarland, [0033]). McFarland further explains that "transmissions addressed to other devices, such as one or more of the controllers 22 are also transmitted," where "receiving controller 22 then routes the signals to the desired or addressed controller 22" (*Id*.). McFarland further states that "[c]ontrollers associated with the sensors and actuators perform the automation without a separate controller for managing or providing control instructions for the building automation or environment function" (McFarland, [0067]; *see also* [0076-0077]).

473. McFarland also discloses that its design is intended to achieve energy savings when implemented, including with respect to performing tasks only when necessary (see, e.g., McFarland, [0009], [0086], [0191]).

474. Thus, for at least the reasons detailed above, to the extent the preamble is limiting, McFarland discloses a "power saving wireless communication within a building automation system." Furthermore, for at least the reasons detailed in relation to Section VI.E.v.a, Ahmed

satisfies this claim element; and, because McFarland incorporates Ahmed '849 by reference, which has the same or substantially the same disclosure as Ahmed, as discussed in section V.B, for at least the same reasons McFarland also satisfies claim element 20[pre].

475. For example, Ahmed '849 discloses a wireless network of automation components within a building. The abstract of Ahmed '849 describes "[a]n apparatus for use in a building system includes at least one microelectromechanical (MEMS) sensor device and a processing circuit that are integrated onto a single substrate," wherein "at least one MEMs sensor device is operable to generate a process value … [t]he processing circuit is operable convert the process value to an output digital signal configured to be communicated to another element of a building automation system … [and] [t]he building automation system includes one or more devices that are operable to generate a control output based on set point information and process value information from one or more sensors" (Ahmed '849 at Abstract).

476. Ahmed '849 discloses equivalent material compared to Ahmed. In particular, Ahmed '849 also discloses the same block diagrams that are disclosed in Ahmed, as Figure 1 and Figure 2, reproduced below.

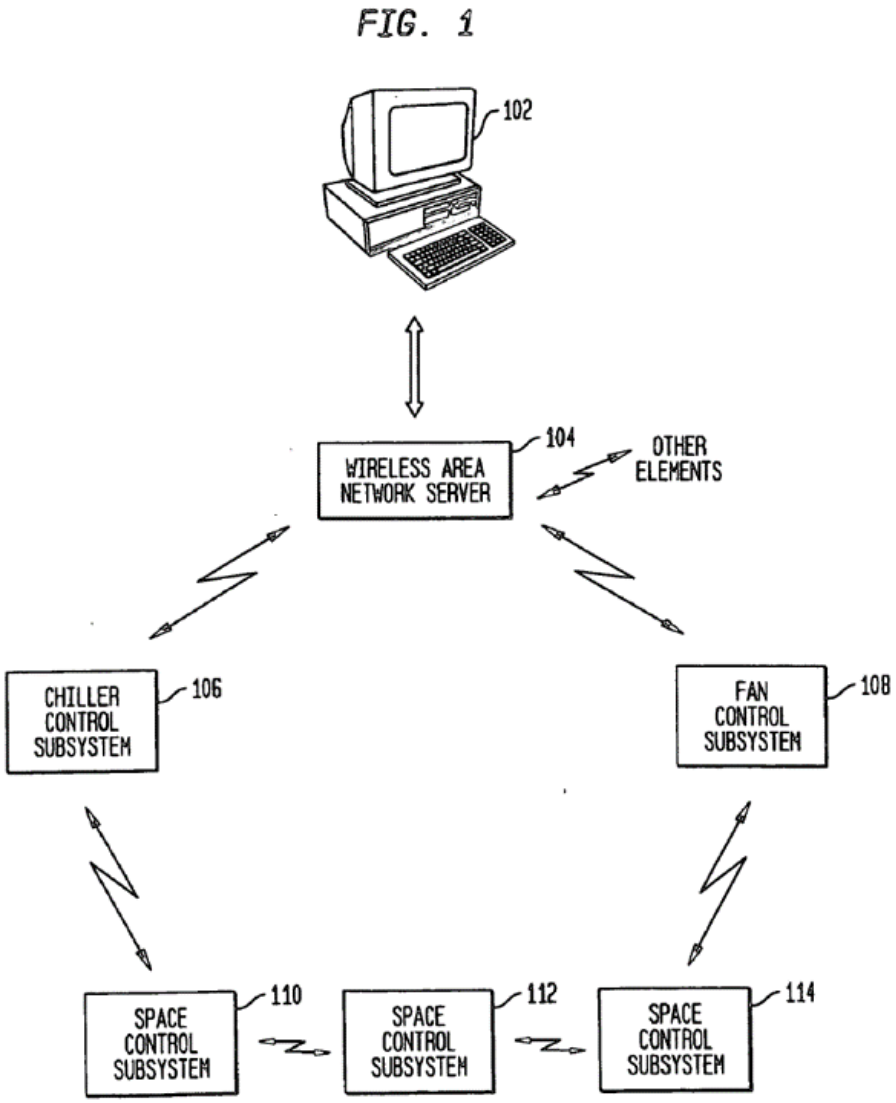


Figure 4. Reproduction of Ahmed '849 Figure 1.

477. Figure 1 of Ahmed '849 shows a block diagram of an exemplary building control system in which a supervisory computer is communicatively coupled to building subsystems via a wireless area network.

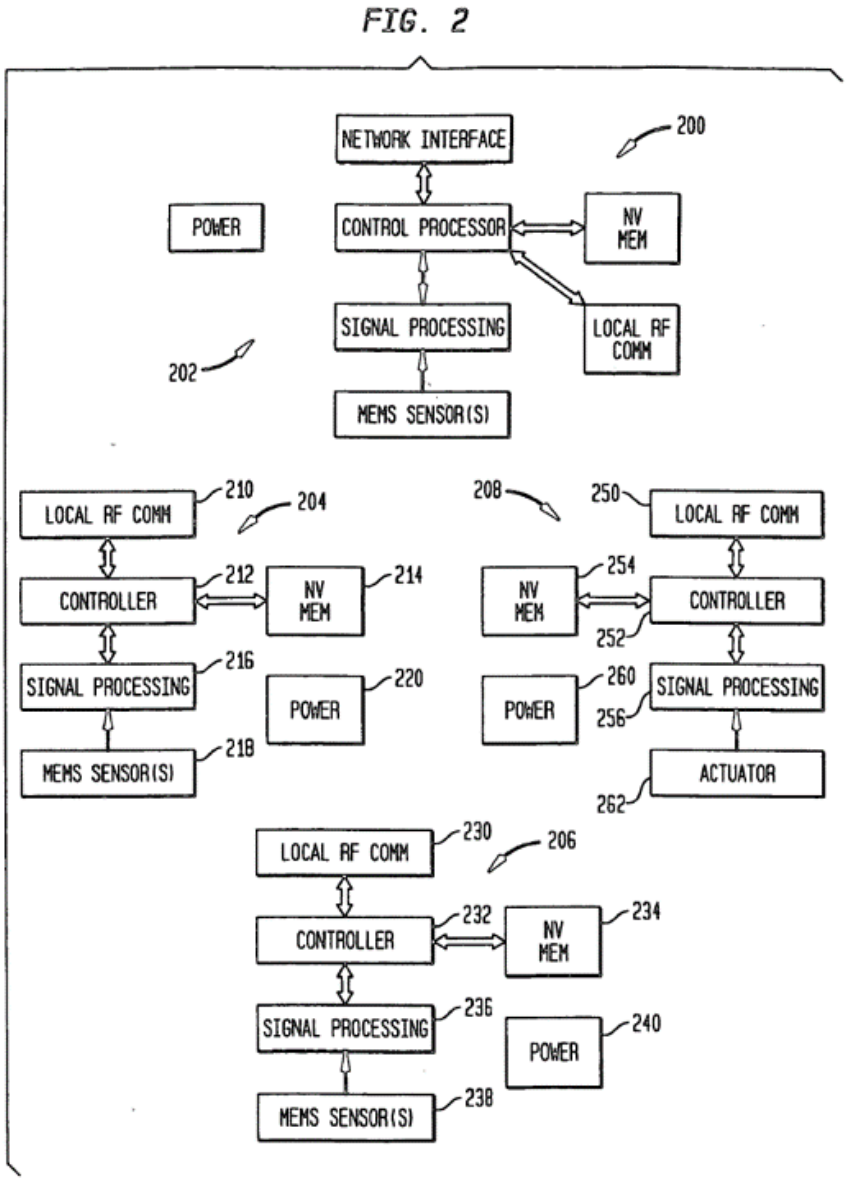


Figure 5. Reproduction of Ahmed '849 Figure 2.

478. Figure 2 of Ahmed '849 shows a "block diagram of an exemplary room control system that may be used as the space control subsystems 110" (Ahmed '849, [0038]), depicted in Figure 1. Each space control subsystem includes a "hub module 202," two "sensor modules 204 and 206," and one "actuator module 208" (Ahmed '849, [0029]). In an example embodiment discussed within Ahmed '849, the room control system of figure 2 is configured to control HVAC equipment whereby "[t]he first sensor module 204 represents a temperature sensor module and is preferably

embodied as a wireless integrated network sensor" (Ahmed '849, [0039]), "[t]he sensor module 206 is configured to operate as a flow sensor" (Ahmed '849, [0052]), and "[t]he actuator module 208 … is operable to control the position of a ventilation damper, thereby controlling the flow of heated or chilled air into the room" (Ahmed '849, [0053]).

479. Thus, each of modules 202, 204, 208, and 206 constitutes example "automation components" as required by claim 1 of the '282 patent. Moreover, the hub module 202 including a "network interface" to communicate with other hub devices as well as "local RF comm" to wirelessly communicate with other modules. The modules 204, 208, and 206 also include "local RF comm" to allow wireless communication between modules. Additionally, Ahmed '849 describes these modules as constituting parts of a building control system which function to autonomously control the environment within "spaces" or "rooms" in a building. Therefore, Ahmed '849 discloses automation components that are part of a wireless communication within a building automation system.

480. In addition, to the extent that the preamble of claim 20 of the '282 Patent is limiting, Kates also discloses an automation component configured for wireless communication within a building automation system that also provides power saving functionality for at least the following reasons.

481. Kates discloses a wireless automation device, for example, describing "[a] low cost, robust, wireless sensor system that provides an extended period of operability without maintenance" (Kates, Abstract). Moreover, Kates discloses a system for autonomous monitoring of anomalous conditions which performs alarm functionality in the event that such a condition is detected (*see, e.g.*, Kates, Abstract). Kates additionally discloses "[i]n one embodiment, the sensor unit is bi-directional and configured to receive instructions from the central reporting station (or repeater). Thus, for example, the central reporting station can instruct the sensor to: perform additional

measurements, go to a standby mode, wake up; report battery status, change wake-up interval, run self-diagnostics and report results, etc." (Kates, [0008]). The bi-directional, wireless sensor units of Kates which can receive and follow instructions constitutes automation components configured for wireless communication within a building automation system.

482. More specifically, as detailed in Section VI.F.i, a POSITA would be motivated to incorporate the energy saving approach of Kates—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of McFarland, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the combination of McFarland and Kates which a POSITA would be motivated to make includes the sensor modules of McFarland with the power saving functionality of Kates, which, for at least the reasons detailed above, satisfy the requirements of the preamble of claim 20 of the '282 patent.

483. Consequently, for at least the reasons above, to the extent that the preamble of claim 20 of the '282 patent is limiting, it is my opinion this preamble is rendered obvious to a POSITA in view of the combination of McFarland with Kates.

484. In addition, regarding the claim term "[first/second] automation component," to the extent that this term applies to the "an automation component" of the claim 1 preamble I have applied the Court's construction for this term in forming my opinions. More specifically, the Court has ordered that the term "[first/second] automation component" be construed to mean "[first/second] component designed to operate without human interaction in an automation system" and I have applied this construction in my analysis. The components and modules of McFarland and Ahmed '849 are used within a building control system to autonomously control the environment within a

room of the building by operating actuator modules based on information from sensor modules, and thus operate without human interaction when performing their usual function. Similarly, the sensor units of Kates operate within an autonomous system for detecting anomalous conditions without human interaction until an alarm is triggered to potentially alert a human to the detected condition. In any event, both McFarland and Ahmed '849 disclose a control subsystem consisting of temperature sensors, actuators, and controllers for controlling HVAC equipment—i.e., they disclose autonomous components consistent with my understanding of Ollnova's accusations, which purport that a thermostat controller and/or associated remote temperature sensors are allegedly automation components that satisfy claim 20 of the '282 patent. Similarly, Kates discloses an autonomous system in which sensor units detect temperatures that are outside of a predetermined range in order to trigger alerts for high or low temperatures. In other words, in the event that Ollnova argues that McFarland or Ahmed '849 do not disclose the claimed autonomous components as construed by the Court, it should be noted that not only does McFarland and Ahmed '849 disclose automation components according to the Court's construction, but these disclosures also satisfy Ollnova's own infringement theories as I understand them.

b. **20[a] scanning sensor data associated with each of a plurality of sensors contained within a multi-sensor package of a first automation component;**

485. McFarland discloses scanning sensor data associated with each of a plurality of sensors contained within a multi-sensor package of a first automation component for at least the following reasons.

486. As discussed in relation to the preamble of claim 1, McFarland discloses a wireless building control system comprised of multiple "sensor arrangements" networked together; where each sensor arrangement can wirelessly communicate to other wireless communication components

(e.g., actuator arrangements and controllers) within the local subsystem; and where each such component constitutes an automation component of claim 1 of the '282 patent.

487. McFarland explains that the disclosed sensor arrangement is "configured to detect a plurality of variables, and generate sensor data for each variable," as required by claim element 1[a], where the sensor data is wirelessly communicated to and used by, for example, actuators to control building components. For example, McFarland states "[t]he sensor performs control processes appropriate for the sensor and regardless of the type of actuator being used, and the output from the sensor is wirelessly communicated to an actuator" (McFarland, [0006]). McFarland also states "[a]ctuators use the output sensor data to provide a response appropriate for the actuator. Controllers monitor the process or action of sensors and actuators without control in one mode of operation" (McFarland, [0027]). Additionally, McFarland also provides embodiments wherein "the higher level wireless network 12 and controllers 22 are operable to instruct redirection of data, such as sensor data from the sensor arrangement 16 to the higher level wireless network 12" (McFarland, [0060]).

488. McFarland also discloses that sensor modules can comprise multiple different sensors, each for sensing different variables, packed together into a sensor suite. More specifically, in reference to sensor arrangement 16, McFarland discloses that "sensor 30 is a temperature sensor, humidity sensor, fire sensor, smoke sensor, occupancy sensor, air quality sensor, gas sensor, CO_2 or CO sensor or other now known or later developed sensors, such as an oxygen sensor for use in hospitals," where "[m]icro-electro-mechanical sensors or larger sensors for sensing any environmental condition may be used." (McFarland, [0035]). Notably, McFarland further states that "[i]n one embodiment, the sensor 30 includes a suit [*sic*] of sensors for sensing multiple environmental conditions" (*Id*., emphasis added).

489. At least because McFarland discloses a suite of sensors in a single device as recited, Ahmed discloses "a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detector variable." Consequently, for at least the reasons above, it is my opinion that McFarland discloses the requirements of claim element 20[a] of the '282 patent.

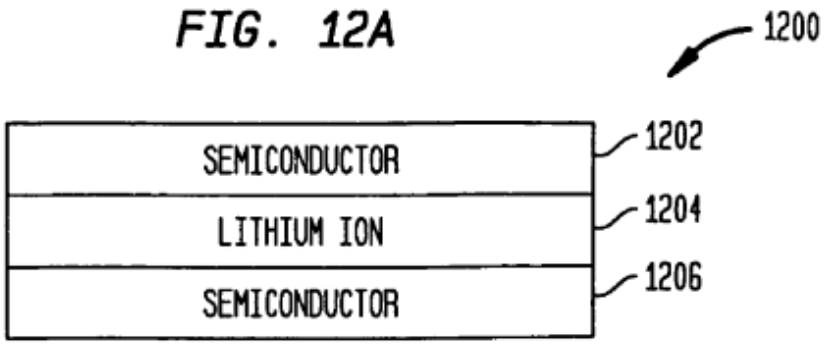
490. Further, for at least the reasons detailed in relation to Section VI.E.v.b, Ahmed satisfies this claim element; and, because McFarland incorporates Ahmed '849 by reference, which has the same or substantially the same disclosure as Ahmed, as discussed in section V.B, for at least the same reasons McFarland also satisfies claim element 20[a].

491. Ahmed '849 discloses scanning sensor data associated with each of a plurality of sensors contained within a multi-sensor package of a first automation component, for at least the following reasons.

492. As discussed in relation to the preamble of claim 20, Ahmed '849 discloses a wireless building control system comprised of multiple "space control subsystems" networked together; where each space control subsystem is comprised of a hub that can wirelessly communicate to other subsystems as well as sensor modules and actuator modules within the local subsystem; and where each hub and module constitute an automation component of claim 20 of the '282 patent.

493. Ahmed '849 also discloses that sensor modules can comprise multiple different sensors, each for sensing different variables, packed together into a sensor suite. More specifically, in reference to MEMS sensor module 218 within an example sensor module, Ahmed '849 discloses that "[t]he MEMS sensor device(s) 218 include at least one MEMS sensor, which may suitably by a temperature sensor, flow sensor, pressure sensor and/or gas-specific sensor. … In a preferred embodiment, several sensors are incorporated into a single device as a sensor suite 218" (Ahmed '849, [0042], emphasis added).

494. Ahmed ’849 provides yet further details, disclosing that the several different sensors within a sensor suite may be fabricated onto a single semiconductor substrate. For instance, figure 12A (reproduced below), shows “a representative side view of a control system module according to an aspect of the invention” (Ahmed ’849, [0031]) that is an example “a single, self-powered, standalone device in which most of the active components are integrated onto one or two semiconductor substrates” (Ahmed ’849, [0102]-[0103]). Ahmed ’849 states “[t]he sensor suite 1252 is collection of MEMS sensors incorporated into a single substrate. The incorporation of multiple MEMS sensor technologies is known” (Ahmed ’849, [0107]). With respect to this design, Ahmed ’849 further explains that “the processing circuit 1256 performs the operations described above in connection with the signal processing circuit 216 and controller 212 of the sensor module 204 of FIG. 2” (Ahmed ’849, [0108]).



Reproduction of Ahmed ’849 Figure 12A.

495. At least because Ahmed ’849 discloses a sensor suite, including incorporating several MEMS sensors on the same semiconductor substrate and packaging this within a single sensor module, Ahmed ’849 discloses “a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detector variable.” Indeed, a POSITA would recognize that integration of different sensors within a single substrate necessitates that these different sensors are packaged together, since otherwise the packaging would necessarily divide the semiconductor material into more than one substrate. Consequently, for at least the reasons above,

it is my opinion that Ahmed '849 discloses the requirements of claim element 20[a] of the '282 patent.

496. In addition, Kates discloses multiple different kinds of sensor packaged within a single sensor unit, stating in relation to example sensor units 102-106 that "[t]he sensor units 102-106 include sensors to measure conditions, such as, for example, smoke, temperature, moisture, water, water, temperature, humidity, carbon monoxide, natural gas, security alarms, intrusion alarms (e.g., open doors, broken windows, open windows, and the like), other flammable gases, radon, poison gasses, etc." and that "[d]ifferent sensor units can be configured with different sensors or with combinations of sensors" (*see* Kates, [0030], emphasis added). Thus, Kates discloses multiple different sensors within a single sensor unit.

497. Kates additionally discloses "[i]n one embodiment, the sensor unit is bi-directional and configured to receive instructions from the central reporting station (or repeater). Thus, for example, the central reporting station can instruct the sensor to: perform additional measurements, go to a standby mode, wake up; report battery status, change wake-up interval, run self-diagnostics and report results, etc." (Kates, [0008]). Moreover, figure 2 of Kates shows that the sensor units therein include "a transceiver 203" (Kates, [0050]). The bi-directional, wireless sensor system which can receive and follow instructions constitutes a wireless automation device.

498. Kates also discloses within this wireless automation device a processor in communication with the wireless communications component and the sensor package. More specifically, in a description of figure 2 of Kates (reproduced below), Kates states "[i]n the sensor unit 102, one or more sensors 201 and a transceiver 203 are provided to a controller 202" (Kates, [0050]), where "the transceiver 203 is based on a TRF 6901 transceiver chip from Texas Instruments" (Kates,

[0051]). The TRF 6901 from Texas Instruments is a single-chip radio frequency (RF) transceiver[8], and thus it would be clear to a POSITA that the controller 203 is in communication with a wireless communications component (i.e., transceiver 203). Thus, it would be clear to a POSITA that the controller 202 in a sensor unit of Kates would be in communication with a wireless communications component (i.e., transceiver 203) and the sensors within the sensor suite (i.e., one or more sensors 201).

499. These requirements would also be obvious to a POSITA in view of the specific combination of these references which a POSITA would be motivated to make. More specifically, as detailed in Section VI.F.i, a POSITA would be motivated to incorporate the energy saving approach of Kates—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of c, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the sensor modules of Ahmed '849—which include multiple different MEMS sensors packaged within the same semiconductor substrate—are included within the combination of McFarland with Kates which a POSITA would be motivated to make, and therefore, for at least the reasons above, this combination satisfies the requirements of claim element 20[a].

500. Consequently, for at least the reasons above, it is my opinion that claim element 20[a] of the '282 patent is rendered obvious to a POSITA in view of McFarland in combination with Kates.

[8] See TRF6901 product page by Texas Instruments, accessed April 17, 2023. TRF6901 data sheet, product information and support | TI.com

c. **20[b] identifying changed sensor values within the sensor data;**

501. The combination of McFarland and Kates discloses identifying changed sensor values within the sensor data, for at least the following reasons.

502. As shown, for example, in Figure 2 of McFarland, each sensor arrangement component includes a processor in communication with a sensor suite and a transmitter. McFarland further states that "[t]he sensor performs control processes appropriate for the sensor and regardless of the type of actuator being used, and the output from the sensor is wirelessly communicated to an actuator" (McFarland, [0006], emphasis added).

503. Similarly, in relation to figure 2 therein, McFarland states that "[t]he processor 32 is a general processor, digital signal processor, control processor, application specific integrated circuit, field programmable gate array, analog circuit, digital circuit, combinations thereof or other now known or later developed device for implementing a control process on a signal measured by the sensor 30," where "[t]he processor 32 has a processing power or capability and associated memory corresponding to the specific sensor 30 or corresponding to the needs of one of a plurality of different types of sensors 30 with a maximum desired processing power, such as an 8 or 16 bit processor" (McFarland, [0036], emphasis added). McFarland further states that "[b]y minimizing the processor requirements and associated memory, the cost of the sensor arrangement 16 may be reduced," where "[t]he processor 32 implements a control process algorithm specific to the sensor arrangement 16" (*Id*., emphasis added).

504. McFarland further explains that "[f]or example, a control algorithm is distributed on both a sensor processor 32 and an actuator processor 38 for performing a single or multiple functions," where "[t]he portion of the control algorithm corresponding to a specific device 16, 18, 20 is then operated or implemented at the specific device without the need of further control" (McFarland,

[0043]). In this regard, "[t]he control algorithm for the temperature function with in [*sic*] the room is distributed on the different sensor arrangement 16 and actuator arrangements 20," and "[t]he sensor arrangement 16 in this corresponding control algorithm outputs information specific to the sensing function without information indicating an act to be performed" (McFarland, [0043]).

505. A POSITA would recognize that the disclosed memory is utilized to store computer-readable instructions (e.g., the "control algorithm") for execution by the processor, as well as information utilized by the processor, at least because embedded memory is typically used in microprocessor systems for these purposes. In any event, McFarland expressly discloses that the memory of the sensor arrangement is in communication with the processor by explaining, at length, that this memory contains configuration information that is utilized by the processor, and the processor implements the disclosed functions of the disclosed system, including the processing of received information and the storage and transmission of sensor data.

506. Further, the storage of sensor data provided by the sensor package within the memory of the modules is inherent in the sensor modules, since these modules measure temperature and convert the signals for transmission (*see* McFarland, [0068]), which a POSITA would understand requires storage of the sensor data, at least temporarily, within a cache or other memory within the sensor module. More specifically, a POSITA would recognize that the disclosed memory within a sensor module is a convenient memory in which to store sensor data after this has been derived from analog sensor data and before it has been transmitted by the communication system. Moreover, a POSITA would understand that such storage is required since there is no guarantee that a transmission will occur exactly when data is acquired and thus storage of the sensor data is necessary at least until it is transmitted. This is consistent with McFarland's disclosure, since a POSITA would recognize that the function of a sensor module necessarily involves obtaining

sensor data and this data will necessarily need to be stored between acquisition and transmission. Therefore, a POSITA would recognize that storage of temperature values between their acquisition and subsequent transmission is required. Furthermore, the storage of sensor data within a sensor is a standard practice which would be expected by a POSITA as a normal feature in remote sensing devices required for their typical functionality.

507. Yet further, with respect to Ahmed '849 (incorporated by reference into McFarland), and as shown in figure 2 of Ahmed '849, each of the modules within a space control subsystem include a nonvolatile memory (labeled as "NV MEM") in the figure. Indeed, in reference to an example embodiment, Ahmed '849 discloses that "sensor module 204 includes a MEMS local RF communication circuit 210, a microcontroller 212, a programmable non-volitive [*sic*] memory 214, a signal processing circuit 216, and one or more MEMS sensors devices 218" (Ahmed '849, [0040]). Ahmed '849 as discloses that programmable non-volatile memory 214 "may be embodied as a flash programmable EEPROM" (Ahmed '849, [0044]), and Figure 7a of Ahmed '849 clearly depicts this EEPROM memory as part of the module circuitry alongside a processing circuit and sensor suite.

508. A POSITA would recognize that the EEPROM is utilized to store programing for execution by the processor, as well as information utilized by the processor, at least because embedded EEPROM memory is typically used in microprocessor systems for these purposes. In any event, Ahmed '849 expressly discloses that the non-volatile memory of the modules is in communication with the processor by explaining, at length, that this memory contains configuration information that is utilized by the processor and that the processor can write into the memory (i.e., the memory is necessarily in communication with the processor). For example, Ahmed '849 discloses that "[t]he microcontroller 212 is further operable to receive configuration information via the RF

communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information" (Ahmed '849, [0047]).

509. The storage of sensor data provided by the sensor package within the non-volatile memory of the modules is inherent in the sensor modules, since these modules convert the analog signals from embedded MEMS sensor devices into digital signals for RF transmission, which a POSITA would understand requires storage of the sensor data, at least temporarily, within a cache or other memory within the sensor module. More specifically, a POSITA would recognize that the flash EEPROM memory within a sensor module is a convenient memory in which to store sensor data after this has been derived from analog sensor data and before it has been transmitted by the RF communication system. Moreover, a POSITA would understand that such storage is required since there is no guarantee that a transmission will occur exactly when data is acquired and thus storage of the sensor data is necessary at least until it is transmitted. This is consistent with Ahmed '849's explicit disclosure that "[t]he EEPROM 1254 also stores information related to the function in which the module 1200 will be used" (Ahmed '849, [0109]), since a POSITA would recognize that the function of a sensor module necessarily involves obtaining sensor data and this data will necessarily need to be stored between acquisition and transmission. Indeed, Ahmed '849 discloses that "the microcontroller 212 determines whether it is time to transmit an updated temperature value to the hub module 202 … [t]he determination of when to transmit temperature values may be driven by a clock internal to the sensor module 204, or in response to a request or query received from the hub mobile 202, or both" (Ahmed '849, [0085]). Therefore, a POSITA would recognize that storage of temperature values between their acquisition and subsequent transmission is required. Furthermore, the storage of sensor data within a sensor is a standard practice which would

be expected by a POSITA as a normal feature in remote sensing devices required for their typical functionality.

510. In addition, Ahmed ’849 discloses that the non-volatile memory of the modules therein stored “computer readable instructions which are executable by the processor.” Indeed, in general, the invention claimed within Ahmed ’849 contemplates space control subsystems utilizing multiple different sensor modules that “have the same physical construction” wherein different sensor modules contain different “configuration information” to determine which of the multiple sensors therein are used by a given sensor module and how each sensor module operates within the control subsystem (*see*, e.g., Ahmed, [0044]). More specifically, Ahmed discloses that “[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information” (Ahmed, [0039]). Furthermore, in relation to the describing how a sensor module may be configured to be a temperature sensor by programming the configuration information, Ahmed ’849 discloses that “[t]he microcontroller 212, responsive to the configuration information, causes the signal processing circuit 216 to process signals only from the temperature sensor, ignoring output from other sensors of the sensor suite 218” (Ahmed, [0041]). Moreover, Ahmed ’849 explicitly discloses that the configuration within the memory includes code required for the processor to utilize the applicable sensors for a specific purpose, stating “in one embodiment of the invention, most or all of the code unique to the selected function of the module is downloaded into the EEPROM 704 during configuration of the device … [t]hus, if the module 600 is to operate as a temperature sensor module, then all appropriate code for a temperature sensor module is downloaded to the EEPROM 704” (Ahmed

’849, [0096]). Thus, the configuration information stored within the memory includes instructions that are executed by the processor to determine how to operate the sensor module.

511. As detailed above, McFarland discloses control information that may be wirelessly received by a sensor arrangement within a building automated control system to determine how the sensor arrangement functions. More broadly, McFarland contemplates a network of multiple wireless components (e.g., sensors and actuators), where each component contains similar hardware and may be configured to perform different functions using stored configuration information that determines, for example, which sensors are utilized and how the processor operates the module. More specifically, McFarland discloses that “[f]or example, a control algorithm is distributed on both a sensor processor 32 and an actuator processor 38 for performing a single or multiple functions,” where “[t]he portion of the control algorithm corresponding to a specific device 16, 18, 20 is then operated or implemented at the specific device without the need of further control” (McFarland, [0043]). In this regard, “[t]he control algorithm for the temperature function with in [*sic*] the room is distributed on the different sensor arrangement 16 and actuator arrangements 20,” and “[t]he sensor arrangement 16 in this corresponding control algorithm outputs information specific to the sensing function without information indicating an act to be performed” (McFarland, [0043]). Thus, McFarland explicitly discloses automation components within a building automation system in which each component may be configured, using configuration information received by the component, to perform a given subset of its possible functions and to perform in various roles required by the building automation system.

512. Furthermore, Ahmed ’849, whose disclosure is expressly incorporated into McFarland, discloses “configuration information” that may be wirelessly received by a module within a space control subsystem to determine how the module functions. More broadly, Ahmed ’849

contemplates a network of multiple modules, where each module is the same but may be configured to perform different functions using stored configuration information that determines, for example, which sensors are utilized and how the processor operates the module. More specifically, Ahmed '849 discloses that each module therein "may readily be configured as any one of a large plurality of sensor types or even other types of building automation system components … reducing the per-unit tooling and design costs associated with ordinary building automation sensors … [i]t will be noted that the design of module 600 may not only be used as the sensor modules 204, 206 in exemplary space control subsystem 200 of FIG. 2, but may also be used as the hub module 202" (Ahmed '849, [0113]). Thus, Ahmed '849 explicitly discloses automation components within a building automation system in which each component may be configured, using configuration information received by the component, to perform a given subset of its possible functions and to perform in various roles required by the building automation system.

513. As previously also discussed, the sensor arrangement disclosed in McFarland discloses what a POSITA would recognize as a memory in communication with the processor that can be used for the storage of sensor data collected by this disclosed sensors. McFarland also discloses that its design is intended to achieve energy savings, including with respect to performing tasks only when necessary (*see*, e.g., McFarland, [0009], [0086], [0191]). Furthermore, the module within a space control subsystem of Ahmed '849 discloses what a POSITA would recognize as a memory in communication with the microcontroller that can be used for the storage of sensor data, at least temporarily in flash memory, collected by the one or more MEMS sensors devices. A POSITA would be motivated to incorporate the energy saving approach of Kates into the control information of McFarland, and the configuration information of Ahmed—in which sensor units

periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. By introducing the power saving aspects of Kates into the BAS disclosed in McFarland and Ahmed '849, specifically that in which sensor readings are evaluated against sensor value threshold criteria prior upon waking up from a sleep, or otherwise transitioning from a periodic low power mode, it becomes obvious to a POSITA to identify sensor values at regular intervals and evaluate them against previously collected readings to determine anomalous conditions or changes of value during the sleep interval. Indeed, McFarland itself recognizes energy savings that can be gained by intermittently energizing circuitry as needed (see McFarland, [0086]). In other words, generally, the approach of Kates involves the sensor unit determining whether or not to transmit sensor data based on criteria to increase battery life by limiting transmission of data; and, it would be obvious to a POSITA that the sensor modules of McFarland and Ahmed '849 could similarly benefit in the same way by incorporating the same kind of determination of whether or not to transmit sensor data at least because the sensor modules of McFarland and Ahmed '849 contain the required processing capabilities and would benefit in the same way as the sensor units of Kates from reduced energy use.

514. More specifically, Kates discloses that "[i]n order to conserve battery power, the sensor is normally placed in a low-power mode," and "while in the low power mode, the sensor unit takes regular sensor readings and evaluates the readings to determine if an anomalous condition exists" (Kates, [0033]). In the invention of Kates, upon evaluation of the readings, "[i]f an anomalous condition is detected, then the sensor unit 'wakes up' and begins communicating with the base unit or with a repeater" (Kates, [0033]). Broadly, the power saving functionality demonstrates that the

teachings of Kates allows for automation components comprising sensors to elongate battery life by only checking the values of sensors at regularly defined intervals, which occur at "programmed intervals," at which "the sensor unit 102 also 'wakes up' and sends status information (e.g., power levels, self[-]diagnostic information, etc.) to the base unit (or repeater) and then listens for commands for a period of time" (Kates, [0033]).

515. In order for the anomalous detection to be communicated from the sensor unit 102, such an anomaly must be detected, which would require the identification of sensor values when it takes readings, and an evaluation of those readings against a set of criteria that would determine if the reading was, in fact, anomalous. Kates explicitly discloses this functionality, namely that "[t]he controller 202 receives sensor data from the sensor(s) 201," and "the controller 202 evaluates the sensor data by comparing the data value to a threshold value (e.g., a high threshold, a low threshold, or a high-low threshold). If the data is outside the threshold (e.g., above a high threshold, below a low threshold, outside an inner range threshold, or inside an outer range threshold), then the data is deemed to be anomalous and is transmitted to the base unit 112" (Kates, [0052]). A POSITA would understand that the high-low threshold "outside an inner range threshold" discloses the change-of-value threshold described in claim 3 of the '282 patent.

516. More specifically, it would be known to a POSITA that there is a finite number of threshold choices available for such an application: (1) a high threshold (i.e., above a high threshold); (2) a low threshold (i.e., below a low threshold); (3) within a range of values (i.e., outside an inner range threshold); (4) not within a range of values (i.e., inside an outer range threshold); and (5) a combination of the previous options. Moreover, a POSITA would understand that the threshold choice above could be applied to *absolute* values (i.e., fixed, predetermined thresholds) or to *relative* values (i.e., thresholds that depend on the previous or current measured values). Indeed, it

is obvious to a POSITA that one criterion that grants the benefits of Kates (i.e., reduced transmission energy usage by selective determination of when to transmit data) could be implemented using a relative application of choice (4) such that data is only transmitted when a meaningful change occurs. This would, for example, increase the battery life of a temperature sensor by preventing repeated transition of the same temperature when a room's temperature is stable; because an HVAC system only needs to act when temperature changes, there is no need for a constant temperature to be repeatedly transmitted and thus the system of Kates achieves its goal of reducing transmission of data without effecting how the HVAC system operates.

517. In more detail, to effectively determine when a sensor reading has changed from that of a previous reading, it would be obvious to a POSITA that a small inner range threshold would be used. For example, if a temperature has a set point of a certain value, an inner range threshold criteria could be plus or minus one degree. Thus, if a temperature reading within a space control subsystem is taken that falls outside of this narrow range, then the system would detect a change-of-value from the set point, and the condition would be reported to the base unit or a second automation component to maintain the system to operate as intended. As such, a POSITA would be motivated to implement the inner rage threshold from Kates as a change-of-value threshold into the BAS of McFarland and Ahmed '849. In other words, using the inner range threshold criteria within the BAS of McFarland and Ahmed '849 would send an alert if a measurement is outside a predefined range, which would be obvious to a POSITA interested in maintaining a system at particular sensor reading values while checking readings periodically, in view of Kates' emphasis on energy efficiency.

518. Thus, by programming the power saving functionality of Kates into the configuration information of the reconfigurable modules of McFarland and Ahmed '849, a POSITA could easily

program an inner range threshold by which sensor values could be detected as different from previous values of the same sensor. Consequently, for at least the reasons above, it is my opinion that McFarland in view of Kates discloses the requirements of claim element 20[b] of the '282 patent.

d. **20[c] receiving a first communication from a second automation component in communication with the first automation component and the building automation system; and**

519. McFarland discloses that in a second mode of operation, one or more sensor arrangements may receive control information from a second automation component in communication with the building automation system, such as a controller.

520. For example, in relation to Figure 2 therein, McFarland states that "[t]he processor 32 has a processing power or capability and associated memory corresponding to the specific sensor 30 or corresponding to the needs of one of a plurality of different types of sensors 30 with a maximum desired processing power, such as an 8 or 16 bit processor" (McFarland, [0036], emphasis added). McFarland further states that "[b]y minimizing the processor requirements and associated memory, the cost of the sensor arrangement 16 may be reduced," where "[t]he processor 32 implements a control process algorithm specific to the sensor arrangement 16" (*Id*., emphasis added).

521. McFarland further explains that "[f]or example, a control algorithm is distributed on both a sensor processor 32 and an actuator processor 38 for performing a single or multiple functions," where "[t]he portion of the control algorithm corresponding to a specific device 16, 18, 20 is then operated or implemented at the specific device without the need of further control." (McFarland, [0043]). In this regard, "[t]he control algorithm for the temperature function with in [*sic*] the room is distributed on the different sensor arrangement 16 and actuator arrangements 20," and "[t]he

sensor arrangement 16 in this corresponding control algorithm outputs information specific to the sensing function without information indicating an act to be performed." (McFarland, [0043]).

522. McFarland additionally discloses that "[i]n another mode of operation, the controllers override the sensor and/or actuators to alter processing based on a regional or larger area control process" (McFarland, [0027]; *see* also McFarland Abstract, [0006], [0050]). The disclosed regional control or "override" by the controllers includes, for example, transmission of operation control instructions, instructions to direct certain sensor data, and communication settings, that are received by the sensor arrangements.

523. For example, McFarland states that transceiver 44 of controller 22 "is operable to send and/or receive information to and/or from any of the sensor arrangements 18, actuator arrangements 20, or other devices 18," where "[i]nformation from various ones of the devices 16, 18 and 20 may be received at the same or different times by the transceiver 44 for aggregate processing and routing by the processor 42" (McFarland, [0053]). McFarland further states that "[t]he transceiver 44 is also operable to transmit information to multiple or specific ones of the devices 16, 18, 20," where such information includes "[f]or example, binding associations, control instructions, communications settings or other information" (*Id*., *see* also McFarland [0061]-[0062]).

524. McFarland further explains that "[i]n overriding local control, the higher level wireless network 12 and controllers 22 are operable to instruct redirection of data, such as sensor data from the sensor arrangement 16 to the higher level wireless network 12" (McFarland, [0060]). McFarland additionally states that, "[a]s another alternative, the sensor and/or actuator arrangements 16, 20 request control input from one or more controllers 22" (*Id*.). As one example, an actuator may forward sensor data received from one or more sensor arrangements to a controller

(alone or in the aggregate), whereafter "[t]he controller 22 outputs control instructions for the actuator arrangement 20 or another device or uses the transmitted information without further control output," and the actuator or other devices then performs tasks consistent with the control instructions received from the controller (*Id*.; see also McFarland, [0061]).

525. With respect to use and redirection of sensor data, McFarland explicitly states that a controller transceiver "is operable to send and/or receive information to and/or from any of the sensor arrangements 18, actuator arrangements 20, or other devices 18," and that the transceiver "is also operable to transmit information to multiple or specific ones of the devices 16, 18, 20." (McFarland, [0053], emphasis added). McFarland further states that controllers may instruct one or more sensor arrangements to perform functions (e.g., adjust set point temperatures), and "[a]ny use of data from multiple sensors and/or actuators, such as data from multiple rooms or other aggregates of data outside of or different than the bindings established for the lower level wireless network 14, are performed by one or more controllers 22" (McFarland, [0062]).

526. Taken together, a POSITA would have understood McFarland's disclosure to describe one or more automation components (e.g., sensor arrangements 16) that may receive control information from a second automation component (e.g., controller 22) in communication with the building automation system, where such information may be an identification of sensor or sensor values driving or controlling the second automation component (e.g., control information identifying of particular sensors or sensor data required by the controller, and that requires redirection to the controller for use by the controller and/or other components within the higher level wireless network). Accordingly, the sensor arrangements of McFarland perform a step of "receiving a first communication from a second automation component in communication with

the first automation component and the building automation system," and it is my opinion that McFarland discloses the requirements of claim element 20[c] of the '282 patent.

527. As detailed above with respect to claim element 20[b], Ahmed '849 discloses "configuration information" that may be wirelessly received by a module within a space control subsystem to determine how the module functions. As also detailed in relation to claim element 20[b], Ahmed '849 contemplates a network of multiple modules, where each module is the same but may be configured to perform different functions using stored configuration information that determines, for example, which sensors are utilized and how the processor operates the module. More specifically, Ahmed '849 discloses that each module therein "may readily be configured as any one of a large plurality of sensor types or even other types of building automation system components … reducing the per-unit tooling and design costs associated with ordinary building automation sensors … [i]t will be noted that the design of module 1200 may not only be used as the sensor modules 204, 206 in exemplary space control subsystem 200 of FIG. 2, but may also be used as the hub module 202" (Ahmed '849, [0113]). Thus, Ahmed '849 explicitly discloses automation components within a building automation system in which each component may be configured, using configuration information received by the component, to perform a given subset of its possible functions and to perform in various roles required by the building automation system.

528. More generally, in reference to a module, Ahmed '849 discloses that "[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information" (Ahmed '849, [0047])—that is, Ahmed '849 discloses that an automation component "receives" configuration information via its wireless communication

device and that this received configuration information is stored in the memory and utilized by the processor to determine how to operate the automation component.

529. Furthermore, the configuration information identifies "sensor or sensor value is driving or controlling a second automation component." More specifically, Ahmed '849 discloses that the configuration information determines which sensor or sensors are required for an automation component's function (e.g., in relation to configuring a sensor module to operate as a temperature sensor as part of an HVAC system). Ahmed '849 discloses "the EEPROM 704 may store information identifying that module 600 should enable its temperature sensing function as opposed to any of its other possible sensing functions" (Ahmed '849, [0109]).

530. In particular, Ahmed '849 discloses that the microprocessor within a sensor module uses the configuration information "to cause the appropriate sensor device or devices from the sensor device suite 218 to be operable connected to the signal processing circuit such that sensed signals from the appropriate sensor device are digitized and provided to the microcontroller 212 … the microcontroller 212 may also use the configuration information to format outgoing messages and/or control operation of the RF communication circuit 210" (Ahmed '849, [0047]). Moreover, in relation to the example embodiment where the sensor module is part of a HVAC control system, Ahmed '849 discloses that "[t]he microcontroller 212, responsive to the configuration information, causes the signal processing circuit 216 to process signals only from the temperature sensor, ignoring output from other sensors of the sensor suite 218" (Ahmed '849, [0049]). Thus, Ahmed '849 explicitly discloses that the configuration information, which is received by a module via the module's RF communication device, identifies the sensor or sensor values that the module should process and transmit.

531. Furthermore, Ahmed ’849 describes that the example space control system of Fig. 2 comprises an HVAC system in which “sensor module 204 is configured to enable its temperature sensing function” (Ahmed, [0042]), “sensor module 206 is configured to operate as a flow sensor” (Ahmed, [0052]), “actuator module 208 … is operable to control the position of a ventilation damper, thereby controlling the flow of heated or chilled air into the room” (Ahmed ’849, [0053]), and “hub module 202 … performs the function of the loop controller (e.g., a PID controller) for the space control subsystem 110” (Ahmed ’849, [0059]). Thus, Ahmed ’849 discloses an example embodiment of a space control system where a temperature sensor, flow sensor, and damper actuator are coordinated via a controller to perform HVAC operations.

532. Accordingly, a POSITA would understand that the temperature sensor provides the inside temperature to the hub, which then determine whether or not adjustments to the actuator are required to enforce programmed temperature settings. Indeed, Ahmed ’849 states that hub module 202 “obtains process variable values (i.e., sensor information) from either or both of the sensor modules 204 and 206 and generates control output values,” “provides the control output values to the actuator module 208,” and also “communicates with external elements of the building control system, for example the supervisory computer, fan or chiller control subsystems, and other room controller subsystems” (Ahmed ’849, [0059], *see* also Ahmed ’849, [0069]).

533. Therefore, at least because Ahmed ’849 explicitly contemplates the use of multiple similar modules which are configured to perform a particular role by configuration information programmed into each module memory, and because the sensor modules are connected to the supervisory computer via the hub modules, each sensor module receives configuration information from a hub module to cause it to function as required by the hub. More specifically, when configuring a space control subsystem of Ahmed ’849 for its purpose, the appropriate

configuration information must be transmitted to each sensor module from the hub. Indeed, a POSITA would understand configuration could be achieved via the supervisory computer—which facilitates network management and coordination of communication of data and control signals (Ahmed ’849, [0082]). Thus, Ahmed ’849 discloses that a module configuration, which a POSITA would understand involves, for example, a controller requisitioning required sensor modules for its assigned control processes via distributing corresponding configuration information.

534. Consequently, for at least the reasons above, the configuration information of Ahmed ’849 is received by sensor modules within space control subsystems from hub modules within the same building control system, and this configuration information is used by the sensor modules to identify which sensor values are required to be transmitted to the hub module. Accordingly, the modules of Ahmed ‘849 perform a step of “receiving a first communication from a second automation component in communication with the first automation component and the building automation system,” and it is my opinion that Ahmed ’849 discloses the requirements of claim element 20[c] of the ’282 patent.

535. In addition to McFarland (and Ahmed ’849 incorporated by reference therein) individually disclosing the requirements of claim element 20[c] of the ’282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of McFarland with Kates which a POSITA would be motivated to make. More specifically, as detailed in Section VI.F.i, a POSITA would be motivated to incorporate the energy saving approach of Kates—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of McFarland, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the combination of McFarland with Kates which a POSITA would be

motivated to make includes the reconfigurable modules of McFarland which utilize control/configuration information in a way that satisfies the limitations of claim element 20[c], and therefore, for at least the reasons above, this combination satisfies the requirements of claim element 20[c].

e. **20[d] communicating a portion of the identified changed sensor values associated with the first communication received from the second automation component.**

536. For at least the reasons detailed in relation to claim element 20[c], a sensor arrangement of McFarland (i.e., an example "automation component") communicates a portion of its stored data corresponding to the received sensor control information from a controller (i.e., an example "second automation component") within the same building automation system. More specifically, as detailed in relation to previous claim elements of claim 20, each sensor arrangement within a building automation system of McFarland receives control information, which may be wirelessly transmitted to each sensor arrangement from one or more controllers; this configuration information is used by each sensor module to identify which sensor or sensor data is needed by the controller (or other high level network components) for control processes, and the corresponding sensor data is transmitted.

537. Consequently, for at least the reasons above, it is my opinion that McFarland discloses the requirements of claim element 20[d] of the '282 patent.

538. Furthermore, for at least the reasons detailed in relation to Section VI.E.v.d, Ahmed satisfies this claim element; and, because McFarland incorporates Ahmed '849 by reference, which has the same or substantially the same disclosure as Ahmed, as discussed in Section V.B, for at least the same reasons McFarland also satisfies claim element 20[d].

539. For at least the reasons detailed in relation to claim element 20[d], a sensor module of Ahmed ’849 (i.e., an example “automation component”) communicates a portion of its stored data corresponding to the received sensor control information from a controller hub (i.e., an example “second automation component”) within the same building automation system. More specifically, as detailed in relation to previous claim elements of claim 20, each sensor module within a space control subsystem of the building automation system of Ahmed ’849 receives “configuration information,” which may be wirelessly transmitted to each sensor module from a controller hub; this configuration information is used by each sensor module to identify which of several different kinds of available sensor data is needed by the hub for the hub’s control processes, and the corresponding sensor data is transmitted to the controller hub.

540. Consequently, for at least the reasons above, it is my opinion that Ahmed ’849 discloses the requirements of claim element 20[d] of the ’282 patent.

541. In addition to McFarland (and Ahmed ’849 incorporated therein) individually disclosing the requirements of claim element 20[d] of the ’282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of McFarland with Kates which a POSITA would be motivated to make. More specifically, as detailed in Section VI.F.i, a POSITA would be motivated to incorporate the energy saving approach of Kates—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of McFarland, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the combination of McFarland with Kates which a POSITA would be motivated to make includes the reconfigurable modules of McFarland which utilize control or configuration information to identify which sensor values should be communicated as required by

claim element 20[d], and therefore, for at least the reasons above, this combination satisfies the requirements of claim element 20[d].

vi.Claim 21

542. Claim 21 of the ’282 Patent recites:

> The method of claim 20, wherein identifying changed sensor values includes identifying changed sensor values as a function of a change-of-value threshold.

543. Claim 21 of the ’282 depends upon claim 20 therein, and includes additional limitations pertaining to the identification of sensor values that exceeds a change-of-value threshold. For at least the reasons detailed above in relation to claim 20, it is my opinion that the combination of McFarland with Kates discloses each and every limitation of claim 20 of the ’282 patent; and, for at least the reasons below, it is my opinion that the combination of McFarland and Kates also renders obvious the limitations added to this claim by claim 21.

544. As previously discussed for claim element 20[b], the combination of McFarland and Kates makes it obvious to a POSITA that in order for the anomalous detection to be communicated from the sensor unit 102, such an anomaly must be detected, which would require the identification of sensor values when it takes readings, and an evaluation of those readings against a set of criteria that would determine if the reading was, in fact, anomalous. Kates explicitly discloses this functionality, namely that “[t]he controller 202 receives sensor data from the sensor(s) 201,” and “the controller 202 evaluates the sensor data by comparing the data value to a threshold value (e.g., a high threshold, a low threshold, or a high-low threshold). If the data is outside the threshold (e.g., above a high threshold, below a low threshold, outside an inner range threshold, or inside an outer range threshold), then the data is deemed to be anomalous and is transmitted to the base unit 112”

(Kates, [0052]). A POSITA would understand that the high-low threshold "outside an inner range threshold" discloses the change-of-value threshold described in claim 3 of the '282 patent.

545. More specifically, it would be known to a POSITA that there is a finite number of threshold choices available for such an application: (1) a high threshold (i.e., above a high threshold); (2) a low threshold (i.e., below a low threshold); (3) within a range of values (i.e., outside an inner range threshold); (4) not within a range of values (i.e., inside an outer range threshold); and (5) a combination of the previous options. Moreover, a POSITA would understand that the threshold choice above could be applied to *absolute* values (i.e., fixed, predetermined thresholds) or to *relative* values (i.e., thresholds that depend on the previous or current measured values). Indeed, it is obvious to a POSITA that one criterion that grants the benefits of Kates (i.e., reduced transmission energy usage by selective determination of when to transmit data) could be implemented using a relative application of choice (4) such that data is only transmitted when a meaningful change occurs. This would, for example, increase the battery life of a temperature sensor by preventing repeated transition of the same temperature when a room's temperature is stable; because an HVAC system only needs to act when temperature changes, there is no need for a constant temperature to be repeatedly transmitted and thus the system of Kates achieves its goal of reducing transmission of data without effecting how the HVAC system operates.

546. In particular, to effectively determine when a sensor reading has changed from that of a previous reading, it would be obvious to a POSITA that a small inner range threshold would be used. For example, if a temperature has a set point of a certain value, an inner range threshold criteria could be plus or minus one degree. Thus, if a temperature reading within a space control subsystem is taken that falls outside of this narrow range, then the system would detect a change-of-value from the set point, and the condition would be reported to the base unit or a second

automation component to maintain the system to operate as intended. As such, a POSITA would be motivated to implement the inner rage threshold from Kates as a change-of-value threshold into the BAS of McFarland. In other words, using the inner range threshold criteria within the BAS of McFarland would send an alert if a measurement were outside a predefined range, which would be obvious to a POSITA interested in maintaining a system at particular sensor reading values while checking readings periodically, in view of Kates' emphasis on energy efficiency.

547. Further, as discussed for claim element 20[b], McFarland discloses that "controllers override the sensor and/or actuators to alter processing based on a regional or larger area control process" (McFarland, [0027]; see also McFarland Abstract; [0006]; [0050]). The disclosed regional control or "override" by the controllers includes, for example, transmission of operation control instructions, instructions to direct certain sensor data, and communication settings, that are received by the sensor arrangements. Similarly, Ahmed '849 discloses that "sensor module 204 includes a MEMS local RF communication circuit 210, a microcontroller 212, a programmable non-volitive [*sic*] memory 214, a signal processing circuit 216, and one or more MEMS sensors devices 218" (Ahmed '849, [0040], emphasis added). As such, it would be obvious to a POSITA to program a change-of-value threshold into the control information of McFarland, or the "configuration information" of Ahmed '849, to allow the sensor module to identify changes in sensor values.

548. Thus, by programming the power saving functionality of Kates into the configuration information of the reconfigurable modules of McFarland, a POSITA could easily program an inner range threshold by which sensor values could be detected as different from previous values of the same sensor; and the sensor module would then be able to identify changes to sensor values as a

function of a change-of-value threshold. Consequently, for at least the reasons above, it is my opinion that McFarland in view of Kates discloses the requirements of claim 21 of the ’282 patent.

G. Claims 1, 3, 6, 20, and 21 of the ’282 Patent are anticipated or obvious to a POSITA in view of McFarland in combination with Liu

i. Motivation to combine McFarland with Liu

549. It is my opinion that a POSITA looking to the teachings of McFarland would have additionally looked to the teachings of Liu and been motivated to combine these prior art references for the reasons detailed below, and by doing so, would have arrived independently at a system that satisfies each and every limitation of asserted Claims 1, 3, 6, 20, and 21 of the ’282 patent.

550. As detailed in Section V, McFarland—including the disclosures of Ahmed ’849, which are expressly incorporated by reference therein—and Liu are both directed to systems comprising components for monitoring and/or control of environmental conditions via wireless communication. Furthermore, McFarland, Ahmed ’849, and Liu each contemplate issues relating to power resource needs of different components, particularly where low power devices or components are used. Thus, McFarland and Liu are within the same field of endeavor and present similar systems to be used in similar applications.

551. As detailed in the discussion of McFarland in section VI.D, the limitations of claims 1 and 6 are disclosed or suggested to a POSITA by McFarland and/or Ahmed ’849, which McFarland incorporates by reference. However, Liu further expressly discloses or suggests to a POSITA aspects of those and additional claims 3, 20, and 21 of the ’282 patent, including power saving functionality and the identification of changes of value within communicated sensor data when implemented into the system components of McFarland and Ahmed ’849, which is expressly disclosed by McFarland, as detailed in Section V.B.

552. McFarland discloses an architecture for a wireless building automation system that involves two "levels" or "tiers" of network. The disclosed network architecture comprises a "first wireless network" operable to enable direct communication between individual sensors and actuators which function independently as sensor-actuator groups to set their output state based on local sensor readings without coordinated control oversight from a controller. The disclosed network architecture further comprises a more-complex "second wireless network" operable to receive sensor output data and communicate with actuators while additionally capable of overriding the control activities of the first network, thereby imposing regional control that supersedes local sensor-actuator operation (*see*, e.g., McFarland, [0006]). McFarland teaches that building automation components may be used with different properties depending on which network in which they are included, such that components in the first network may have different frequencies and communication protocols, different power requirements, and different communication ranges (see, e.g., McFarland, [0029]-[0031], [0034], [0036]-[0040]), compared to those in the second network.

553. Ahmed '849, and thus McFarland, discloses "a building control system that incorporates wireless communications and/or microelectromechanical ("MEMs") technology" (Ahmed '849, [0009]). Ahmed '849 teaches that benefits of its system include reduced wiring requirements and reduce power consumption, including when battery operated modules are used (Ahmed '849, [0048]-[0051], [0191]). In addition, Ahmed '849 contemplates space control subsystems utilizing multiple different sensor modules that may contain different "configuration information" to determine which of the multiple sensors therein are used by a given sensor module and how each sensor module operates within the control subsystem (*see*, e.g., Ahmed '849, [0047]-[0052]). More specifically, Ahmed '849 discloses that "[t]he microcontroller 212 is further operable to receive

configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information" (Ahmed '849, [0047]), for example, "caus[ing] the signal processing circuit 216 to process signals only from the temperature sensor, ignoring output from other sensors of the sensor suite 218" (Ahmed '849, [0049]). Moreover, Ahmed '849 discloses the configuration information stored within the memory includes instructions that are executed by the processor to determine how to operate the sensor module (see, e.g., Ahmed '849, [0011]).

554. Liu is direct to an apparatus that "comprises one or more sensors for sensing conditions at the component or articles and producing one or more signals and a wireless transmitter for wirelessly transmitting data based on the one or more signals to a remote device" (Liu, [0006]) in order to obtain information about environmental conditions. Liu further teaches a "network for detecting environmental conditions for a structure" (Liu, [0006]), and describes that "[w]ireless sensing nodes may be manufactured to create networks for gathering data from distributed sources where wiring would be too difficult, dangerous, or expensive to implement" (Liu, [0018]).

555. Liu elaborates on additional techniques and methods to employ power saving functionality within these well-known building automation systems with examples of algorithms for further reducing power consumption to maximize the length of operation of automation components. In more detail, Liu discloses that in order to conserve power, if a "sleep mode is entered 94, and the sensor node 10, 50 waits for a signal to wake, which may be at a particular time, after a particular time interval, or upon receipt of an outside signal," and that "[o]nce awakened, the sensor node 10, 50 receives (step 70) a new signal input from the sensor 30, 32" (Liu, [0049]), which would then be processed and evaluated by the control circuitry 35 to determine whether to not to transmit the data to another unit. Broadly, this power saving functionality demonstrates that the teachings

of Liu allows for automation components comprising sensors to elongate battery life by only checking the values of sensors at regularly defined intervals, which occur at "a particular time" or "after a particular time interval."

556. A POSITA would be motivated to incorporate the energy saving approach of Liu—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of Ahmed '849 in the two-tiered wireless network architecture of McFarland—in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems. That is, the combination of McFarland and Liu which a POSITA would be motivated to make includes the sensor modules of Ahmed '849 utilized within the first wireless network of McFarland—comprising, for example, battery powered components communicating over short distances—employing the power-conserving communication logic and operating modes disclosed by Liu.

557. Moreover, a POSITA would have recognized that the disclosures of McFarland (and Ahmed '849) and Liu are compatible with each other and would have been able to implement the above-described combination without undue experimentation to achieve predictable results. That is, the specific combination of McFarland and Liu that a POSITA would have been motivated to make could be employed with the physical architecture disclosed by McFarland and Ahmed '849, and thus would not have required significant design changes or further engineering. Rather, the combination would have only required a POSITA to implement the wireless communication functionality, including the incorporation of Liu's disclosed operating modes, on the existing system of McFarland.

558. Thus, for reasons described above as well as those discussed in the claim-by-claim analysis below, it is my opinion that a POSITA have been motivated to combine McFarland and Liu to arrive at the specific combination of these prior art references detailed above.

ii.Claim 1

559. Claim 1 of the ’282 Patent recites:

> An automation component configured for wireless communication within a building automation system, the automation component comprising:
>
> a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable;
>
> a wireless communications component;
>
> a processor in communication with the wireless communications component and the sensor package;
>
> a memory in communication with the processor, the memory configured to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor; wherein the computer readable instructions are programmed to:
>
> receive sensor control information related to sensor data in control at a second automation component in communication with the building automation system; and
>
> communicate a portion of the stored sensor data corresponding to the received sensor control information to the second automation component.

560. Thus, claim 1 of the ’282 patent is directed towards a wireless automation component within a building automation system, and includes limitations pertaining to selective communication of sensor data between different automation components within the building automation system. For at least the reasons detailed below, each and every limitation of claim 1 of

the ’282 patent is obvious to a POSITA in view of the combination of McFarland with Liu detailed in Section VI.G.i.

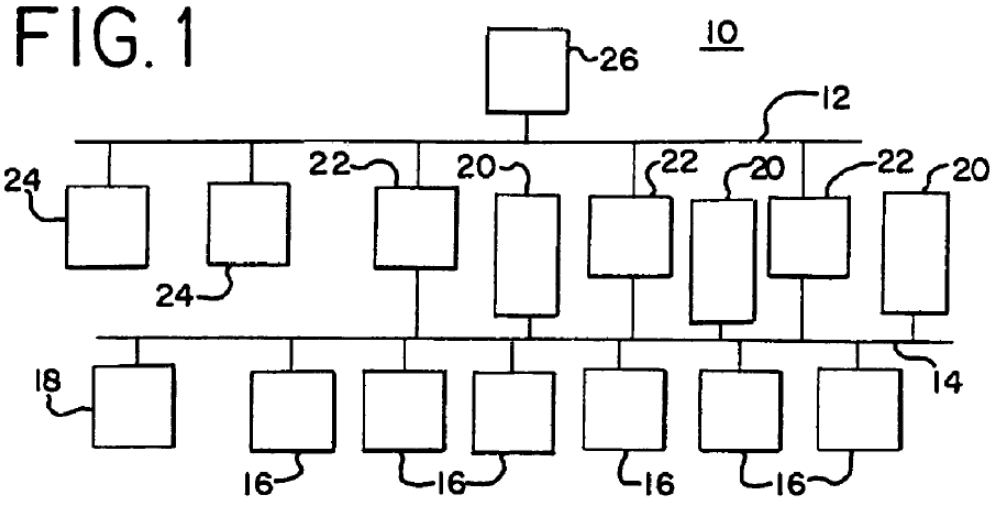
a. **1[pre] An automation component configured for wireless communication within a building automation system, the automation component comprising**

561. To the extent that the preamble of claim 1 of the ’282 patent is limiting, McFarland discloses an automation component configured for wireless communication within a building automation system.

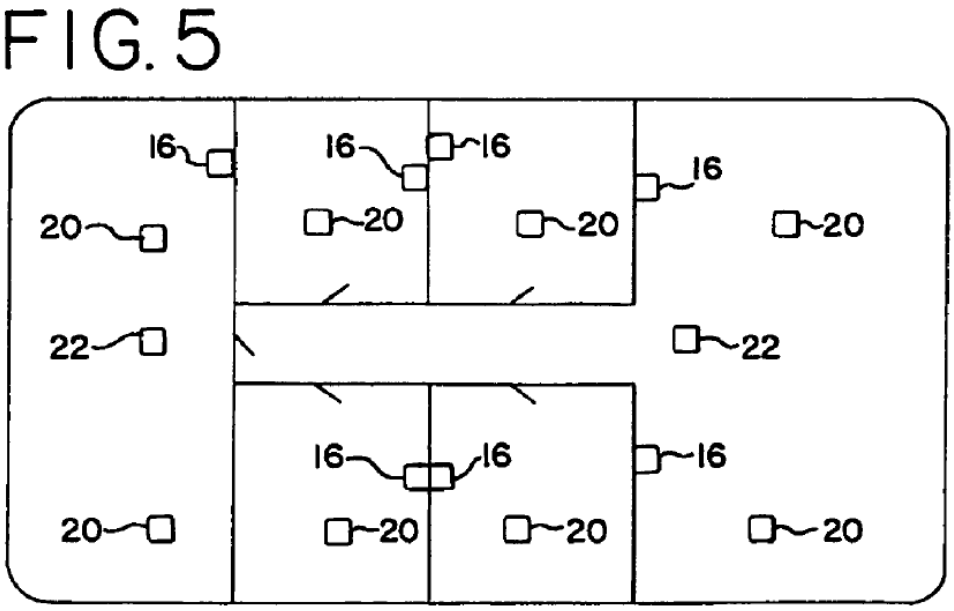
562. McFarland discloses a system comprising a “lower level network” and a “high level network,” comprising wireless communications networks, (McFarland, [0028]), which includes components configured for wireless communication equipped to control building automation. With respect to Figure 1, McFarland states “[o]ne of the wireless networks 12 is a high level control network, and the other wireless network 14 is a lower level operations network.” More specifically, McFarland discloses, with respect to Figure 1 shown therein, a block diagram of a multi-tier wireless building automation control system architecture (McFarland, [0019]), including sensor arrangements (16) configured for communication with actuator arrangements (20), and controller (22), each of which constitute wireless automation components configured for wireless communication within a building automation system. (*see*, e.g., McFarland, Abstract, [0002]-[0004], [0006], [0010], [0026]). McFarland states in its Abstract, for example, that “[o]n a first level of the wireless building automation architecture, sensors and associated actuators communicate directly,” where “[t]he sensor performs control processes appropriate for the sensor and regardless of the type of actuator being used,” and “[t]he actuator performs control processes specific to the actuator regardless of the type of sensor being used” (McFarland at Abstract). In particular, McFarland explains

> [t]he sensor reports information appropriate or specific to the sensor, such as reporting the result of a comparison of a measured value to a desired or set point value. Actuators use the output sensor data to provide a response appropriate for the actuator. Controllers monitor the process or action of sensors and actuators without control in one mode of operation. In another mode of operation, the controllers override the sensor and/or actuators to alter processing based on a regional or larger area control process (McFarland, [0031], see also, e.g., [0050]-[0054]; [0056]-[0057]).

563. Figure 1 and Figure 5 of McFarland, reproduced below, illustrate exemplary arrangements of automation components of the disclosed system in a building automation system.

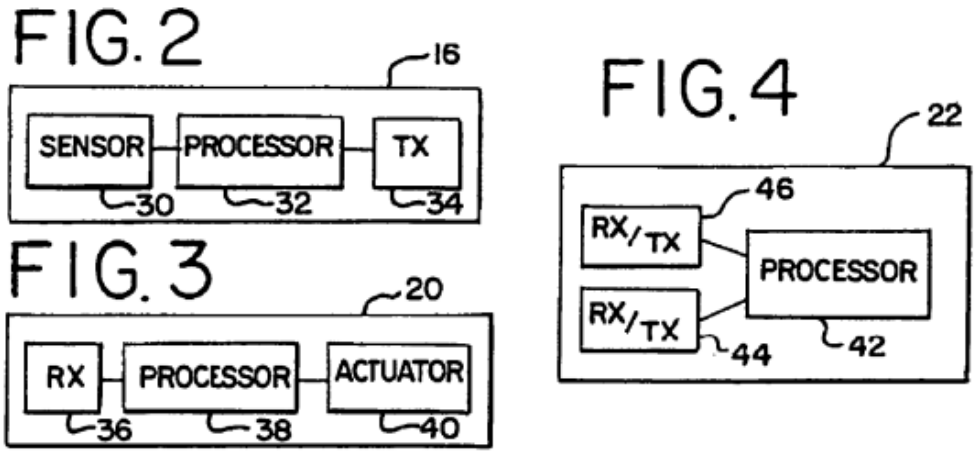


Reproduction of McFarland figure 1.



Reproduction of McFarland figure 5.

564. Figures 2, 3, and 4 of McFarland shows block diagrams of exemplary automation components (sensor arrangement, actuator arrangement, controller) that wirelessly communicate and operate within its disclosed system:



Reproduction of McFarland Figures 2, 3, and 4.

565. McFarland discloses that such sensor, actuators, and controllers may each include processors as well as transceivers for transmitting and/or receiving wireless communications signals. For example, McFarland explains that sensor arrangement 16 "includes a sensor 30, a sensor processor 32 and a transmitter 34," where "transmitter 34 is a radio frequency transmitter"

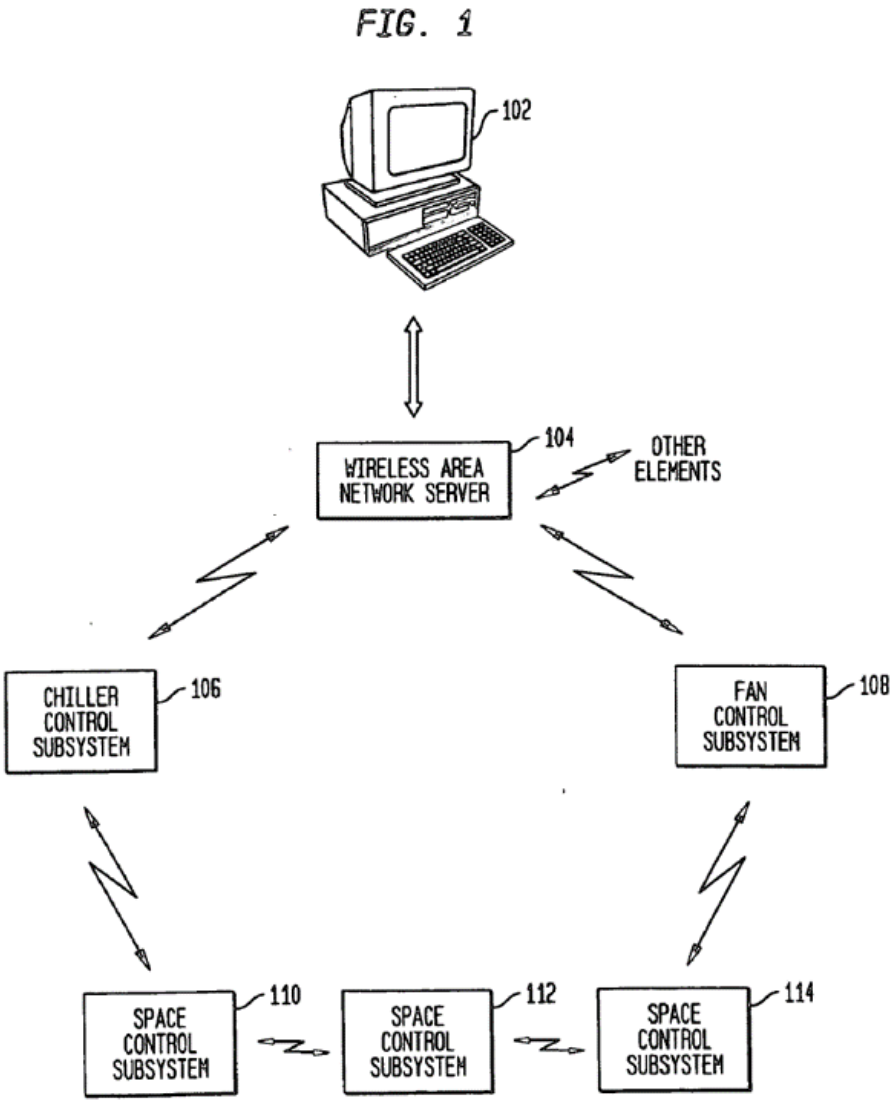
(McFarland, [0034], [0037]). McFarland further explains that actuator arrangement 20 "includes a receiver 36, an actuator processor 38 and an actuator 40," where "receiver 36 is a radio frequency receiver" (McFarland, [0038]-[0039]). McFarland further explains that controller 22 "include one or more processors 42 and two transceivers 44, 46," where "[o]ne transceiver 44 is operable for connecting with the lower level network 14," and "transceiver 46 is operable to transmit and receive information to and from other controllers 22, or other devices 24 and 26 of the high level wireless network 12" (McFarland, [0052]-[0054]).

566. McFarland discloses that "in one embodiment, sensor arrangements 16, other devices 18 and/or the actuator arrangements 20 operate as full function devices of 802.15.4 allowing for dynamically assigned communications with different devices over a single or multiple communications path but without the ability to route routing communications from other devices" (McFarland, [0033]). McFarland further explains that "transmissions addressed to other devices, such as one or more of the controllers 22 are also transmitted," where "receiving controller 22 then routes the signals to the desired or addressed controller 22" (*Id*.). McFarland further states that "[c]ontrollers associated with the sensors and actuators perform the automation without a separate controller for managing or providing control instructions for the building automation or environment function" (McFarland, [0067]; *see also* McFarland[0076-0077]).

567. Thus, for at least the reasons detailed above, to the extent the preamble is limiting, McFarland discloses "[a]n automation component configured for wireless communication within a building automation system." Further, for at least the reasons detailed in relation to Section VI.C.i.a, Ahmed satisfies this claim element; and, because McFarland incorporates Ahmed '849 by reference, which has the same or substantially the same disclosure as Ahmed, as discussed in section V.B, for at least the same reasons McFarland also satisfies claim element 1[pre].

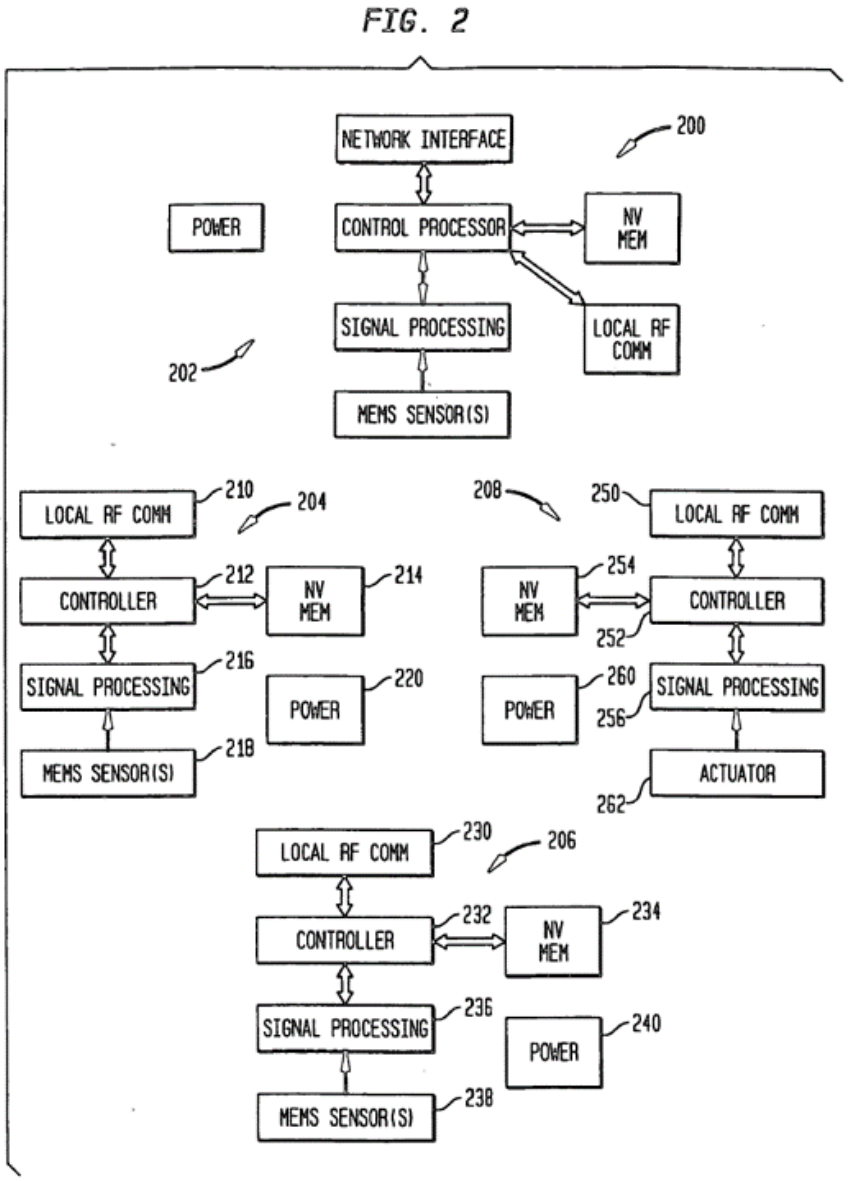
568. For example, Ahmed ’849 discloses a wireless network of automation components within a building. The abstract of Ahmed ’849 describes “[a]n apparatus for use in a building system includes at least one microelectromechanical (MEMS) sensor device and a processing circuit that are integrated onto a single substrate,” wherein “at least one MEMs sensor device is operable to generate a process value … [t]he processing circuit is operable convert the process value to an output digital signal configured to be communicated to another element of a building automation system … [and] [t]he building automation system includes one or more devices that are operable to generate a control output based on set point information and process value information from one or more sensors” (Ahmed ’849, Abstract).

569. Ahmed ’849 discloses equivalent material compared to Ahmed. In particular, Ahmed ’849 also discloses the same block diagrams that are disclosed in Ahmed, as Figure 1 and Figure 2, reproduced below.



Reproduction of Ahmed '849 Figure 1.

570. Figure 1 of Ahmed '849 shows a block diagram of an exemplary building control system in which a supervisory computer is communicatively coupled to building subsystems via a wireless area network.



Reproduction of Ahmed '849 Figure 2.

571. Figure 2 of Ahmed '849 shows a "block diagram of an exemplary room control system that may be used as the space control subsystems 110" (Ahmed '849, [0038]), depicted in Figure 1. Each space control subsystem includes a "hub module 202," two "sensor modules 204 and 206," and one "actuator module 208" (Ahmed '849, [0029]). In an example embodiment discussed within Ahmed '849, the room control system of figure 2 is configured to control HVAC equipment whereby "[t]he first sensor module 204 represents a temperature sensor module and is preferably

embodied as a wireless integrated network sensor" (Ahmed '849, [0039]), "[t]he sensor module 206 is configured to operate as a flow sensor" (Ahmed '849, [0052]), and "[t]he actuator module 208 … is operable to control the position of a ventilation damper, thereby controlling the flow of heated or chilled air into the room" (Ahmed '849, [0053]).

572. Thus, each of modules 202, 204, 208, and 206 constitutes example "automation components" as required by claim 1 of the '282 patent. Moreover, the hub module 202 including a "network interface" to communicate with other hub devices as well as "local RF comm" to wirelessly communicate with other modules. The modules 204, 208, and 206 also include "local RF comm" to allow wireless communication between modules. Additionally, Ahmed '849 describes these modules as constituting parts of a building control system which function to autonomously control the environment within "spaces" or "rooms" in a building. Therefore, Ahmed '849 discloses automation components that are configured for wireless communication within a building automation system.

573. Consequently, for at least the reasons above, to the extent that the preamble of claim 1 of the '282 patent is limiting, it is my opinion that McFarland and Ahmed '849 (incorporated into McFarland) disclose the requirements of this preamble.

574. In addition, to the extent that the preamble of claim 1 of the '282 Patent is limiting, Liu also discloses an automation component configured for wireless communication within a building automation system for at least the following reasons.

575. Liu discloses a wireless automation device, for example Liu describes an "apparatus compris[ing] one or more sensors for sensing conditions at the component or articles and producing one or more signals and a wireless transmitter for wirelessly transmitting data based on the one or more signals to a remote device" (Liu, Abstract). Moreover, Liu discloses a system for

autonomous reporting of environmental conditions which may be programmed to perform an alarm functionality, for example (*see*, e.g., Liu, [0048]). Liu additionally discloses "[t]he RF transceiver 36 [of the sensor apparatus], with the antenna 37, sends data to the hub 14 or other outer device, and may receive commands for controlling functions of the sensor node 10, 35. The antenna 37 may be, for example, an array of directional antennas and/or a multidirectional antenna" (Liu, [0042]). The multi-directional, wireless sensor units of Liu which can receive and follow instructions constitutes automation components configured for wireless communication within a building automation system. Thus, for at least the reasons above, Liu discloses the requirements of the preamble of claim 1 of the '282 patent to the extent these are limiting.

576. In addition to each of McFarland (including Ahmed '849) and Liu individually disclosing the requirements of the preamble of claim 1 of the '282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of these references which a POSITA would be motivated to make. More specifically, as detailed in Section VI.G.i, a POSITA would be motivated to incorporate the energy saving approach of Liu—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of McFarland, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the combination of McFarland and Liu which a POSITA would be motivated to make includes the sensor modules of McFarland, which, for at least the reasons detailed above, satisfy the requirements of the preamble of claim 1 of the '282 patent.

577. Consequently, for at least the reasons above, to the extent that the preamble of claim 1 of the '282 patent is limiting, it is my opinion this preamble is rendered obvious to a POSITA in view of the combination of McFarland with Liu.

578. In addition, regarding the claim term "[first/second] automation component," to the extent that this term applies to the "an automation component" of the claim 1 preamble I have applied the Court's construction for this term in forming my opinions. More specifically, the Court has ordered that the term "[first/second] automation component" be construed to mean "[first/second] component designed to operate without human interaction in an automation system" and I have applied this construction in my analysis. The components and modules of McFarland and Ahmed '849 are used within a building control system to autonomously control the environment within a room of the building by operating actuator modules based on information from sensor modules, and thus operate without human interaction when performing their usual function. Similarly, the sensor units of Liu operate within an autonomous system for detecting environmental conditions without human interaction until programming instructs the component to transmit data. In any event, both McFarland and Ahmed '849 disclose a control subsystem consisting of temperature sensors, actuators, and controllers for controlling HVAC equipment—that is, they disclose autonomous components consistent with my understanding of Ollnova's accusations, which purport that a thermostat controller and/or associated remote temperature sensors are allegedly automation components that satisfy claim 1 of the '282 patent. Similarly, Liu discloses an autonomous system in which sensor units detect environmental conditions which are evaluated prior to communicating data. In other words, in the event that Ollnova argues that the combination of McFarland and Liu which a POSITA would be motivated to make does not disclose the claimed autonomous components as construed by the Court, it should be noted that not only does This combination disclose automation components according to the Court's construction, but these disclosures also satisfy Ollnova's own infringement theories as I understand them.

b. **1[a] a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable;**

579. McFarland discloses wireless automation components that include a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable, for at least the following reasons.

580. As discussed in relation to the preamble of claim 1, McFarland discloses a wireless building control system comprised of multiple "sensor arrangements" networked together; where each sensor arrangement can wirelessly communicate to other wireless communication components (e.g., actuator arrangements and controllers) within the local subsystem; and where each such component constitutes an automation component of claim 1 of the '282 patent.

581. McFarland explains that the disclosed sensor arrangement is "configured to detect a plurality of variables, and generate sensor data for each variable," as required by claim element 1[a], where the sensor data is wirelessly communicated to and used by, for example, actuators to control building components. For example, McFarland states "[t]he sensor performs control processes appropriate for the sensor and regardless of the type of actuator being used, and the output from the sensor is wirelessly communicated to an actuator" (McFarland, [0006]). McFarland also states "[a]ctuators use the output sensor data to provide a response appropriate for the actuator. Controllers monitor the process or action of sensors and actuators without control in one mode of operation" (McFarland, [0027]). Additionally, McFarland also provides embodiments wherein "the higher level wireless network 12 and controllers 22 are operable to instruct redirection of data, such as sensor data from the sensor arrangement 16 to the higher level wireless network 12" (McFarland, [0060]).

582. McFarland also discloses that sensor modules can comprise multiple different sensors, each for sensing different variables, packed together into a sensor suite. More specifically, in reference

to sensor arrangement 16, McFarland discloses that "sensor 30 is a temperature sensor, humidity sensor, fire sensor, smoke sensor, occupancy sensor, air quality sensor, gas sensor, CO_2 or CO sensor or other now known or later developed sensors, such as an oxygen sensor for use in hospitals," where "[m]icro-electro-mechanical sensors or larger sensors for sensing any environmental condition may be used" (McFarland, [0035]). Notably, McFarland further states that "[i]n one embodiment, the sensor 30 includes a suit [*sic*] of sensors for sensing multiple environmental conditions" (*Id*., emphasis added).

583. Consequently, for at least the reasons above, it is my opinion that McFarland discloses the requirements of claim element 1[a] of the '282 patent. Further, for at least the reasons detailed in relation to Section VI.C.i.b, Ahmed satisfies this claim element; and, because McFarland incorporates Ahmed '849 by reference, which has the same or substantially the same disclosure as Ahmed, as discussed in Section V.B, for at least the same reasons McFarland also satisfies claim element 1[a].

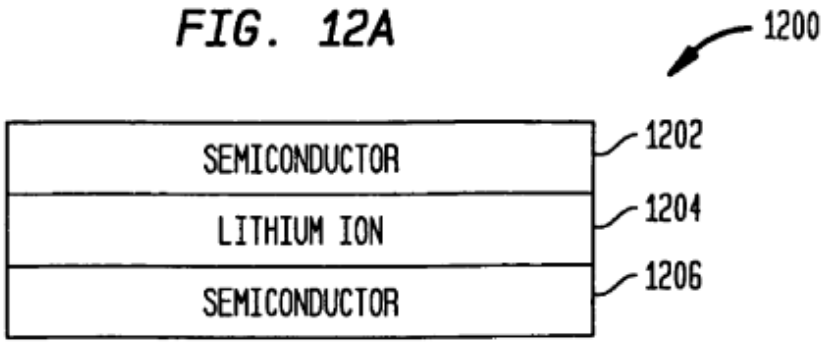
584. Ahmed '849 discloses wireless automation components that include a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable, for at least the following reasons.

585. As discussed in relation to the preamble of claim 1, Ahmed '849 discloses a wireless building control system comprised of multiple "space control subsystems" networked together; where each space control subsystem is comprised of a hub that can wirelessly communicate to other subsystems as well as sensor modules and actuator modules within the local subsystem; and where each hub and module constitute an automation component of claim 1 of the '282 patent.

586. Ahmed '849 also discloses that sensor modules can comprise multiple different sensors, each for sensing different variables, packed together into a sensor suite. More specifically, in

reference to MEMS sensor module 218 within an example sensor module, Ahmed '849 discloses that "[t]he MEMS sensor device(s) 218 include at least one MEMS sensor, which may suitably by a temperature sensor, flow sensor, pressure sensor and/or gas-specific sensor. … In a preferred embodiment, several sensors are incorporated into a single device as a sensor suite 218" (Ahmed '849, [0042], emphasis added).

587. Ahmed '849 provides yet further details, disclosing that the several different sensors within a sensor suite may be fabricated onto a single semiconductor substrate. For instance, figure 12A (reproduced below), shows "a representative side view of a control system module according to an aspect of the invention" (Ahmed '849, [0031]) that is an example "a single, self-powered, standalone device in which most of the active components are integrated onto one or two semiconductor substrates" (Ahmed '849, [0102]-[0103]). Ahmed '849 states "[t]he sensor suite 1252 is collection of MEMS sensors incorporated into a single substrate. The incorporation of multiple MEMS sensor technologies is known" (Ahmed '849, [0107]). With respect to this design, Ahmed '849 further explains that "the processing circuit 1256 performs the operations described above in connection with the signal processing circuit 216 and controller 212 of the sensor module 204 of FIG. 2" (Ahmed '849, [0108]).



Reproduction of Ahmed '849 Figure 12A.

588. At least because Ahmed '849 discloses a sensor suite, including incorporating several MEMS sensors on the same semiconductor substrate and packaging this within a single sensor

module, Ahmed ’849 discloses “a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detector variable.” Indeed, a POSITA would recognize that integration of different sensors within a single substrate necessitates that these different sensors are packaged together, since otherwise the packaging would necessarily divide the semiconductor material into more than one substrate. Consequently, for at least the reasons above, it is my opinion that Ahmed ’849 discloses the requirements of claim element 1[a] of the ’282 patent.

589. In addition to each of McFarland (including Ahmed ’849) and Liu individually disclosing the requirements of claim element 1[a] of the ’282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of these references which a POSITA would be motivated to make. More specifically, as detailed in Section VI.G.i, a POSITA would be motivated to incorporate the energy saving approach of Liu—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of McFarland, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the sensor modules of McFarland—which include multiple different MEMS sensors packaged within the same semiconductor substrate disclosed in Ahmed ’849—are included within the combination of McFarland with Liu which a POSITA would be motivated to make, and therefore, for at least the reasons above, this combination satisfies the requirements of claim element 1[a].

590. Consequently, for at least the reasons above, it is my opinion that claim element 1[a] of the ’282 patent is rendered obvious to a POSITA in view of McFarland in combination with Liu.

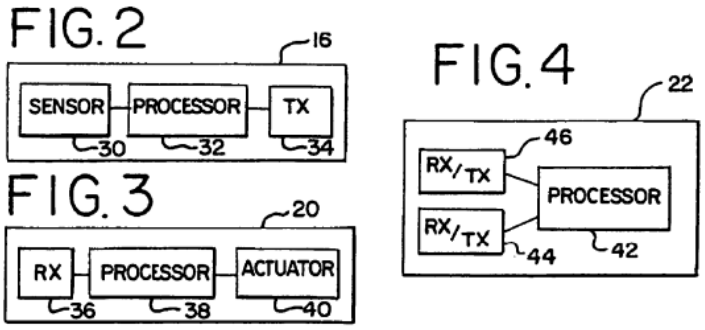
591. In addition to satisfying the requirements of the claim language as these would be understood by a POSITA, I understand that the combination of McFarland and Liu also satisfies the position within Ollnova's infringement contentions pertaining to claim element 1[a] of the '282 patent. More specifically, I understand that Ollnova's contentions do not address the packaging of multiple sensors at all, and instead contend that each ecobee thermostat comprises a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detector variable merely because ecobee thermostats include temperature, humidity, occupancy, and/or proximity sensors. As discussed above, each of McFarland and Liu explicitly disclose that the modules therein include several different sensors, and to the extent that Ollnova relies on the inclusion of multiple sensors, McFarland and Liu satisfy Ollnova's contentions—that is, in the event that Ollnova argues that the combination of McFarland and Liu do not disclose a multi-sensor package, it should be noted that not only does the combination of McFarland and Liu disclose a multi-sensor package explicitly, as required by the claim language, but these same disclosures also satisfy the broader position within Ollnova's contentions which merely requires more than one kind of sensor within a device regardless of how these are packaged.

c. **1[b] a wireless communications component;**

592. McFarland discloses wireless automation components, as discussed in relation to the preamble of claim 1 of the '282 patent, and thus these automation components satisfy the requirements of claim element 1[b] of including "a wireless communications component."

593. McFarland discloses a "Wireless Building Control Architecture," and states in its Abstract, for example, that "[o]n a first level of the wireless building automation architecture, sensors and associated actuators communicate directly," where "[t]he sensor performs control processes appropriate for the sensor and regardless of the type of actuator being used," and "[t]he actuator

performs control processes specific to the actuator regardless of the type of sensor being used." In Figures 2, 3 and 4, McFarland also provides block diagrams of exemplary automation components (sensor arrangement, actuator arrangement, controller) that wirelessly communicate and operate within its disclosed system:



Reproduction of McFarland Figures 2, 3, and 4.

594. For example, McFarland states that sensor arrangement 16 "includes a sensor 30, a sensor processor 32 and a transmitter 34," where "transmitter 34 is a radio frequency transmitter" (McFarland, [0034], [0037]). McFarland further explains that actuator arrangement 20 "includes a receiver 36, an actuator processor 38 and an actuator 40," where "receiver 36 is a radio frequency receiver" (McFarland, [0038]-[0039]). McFarland additionally explains that controller 22 "include one or more processors 42 and two transceivers 44, 46," where "[o]ne transceiver 44 is operable for connecting with the lower level network 14," and "transceiver 46 is operable to transmit and receive information to and from other controllers 22, or other devices 24 and 26 of the high level wireless network 12." (McFarland, [0052]-[0054]).

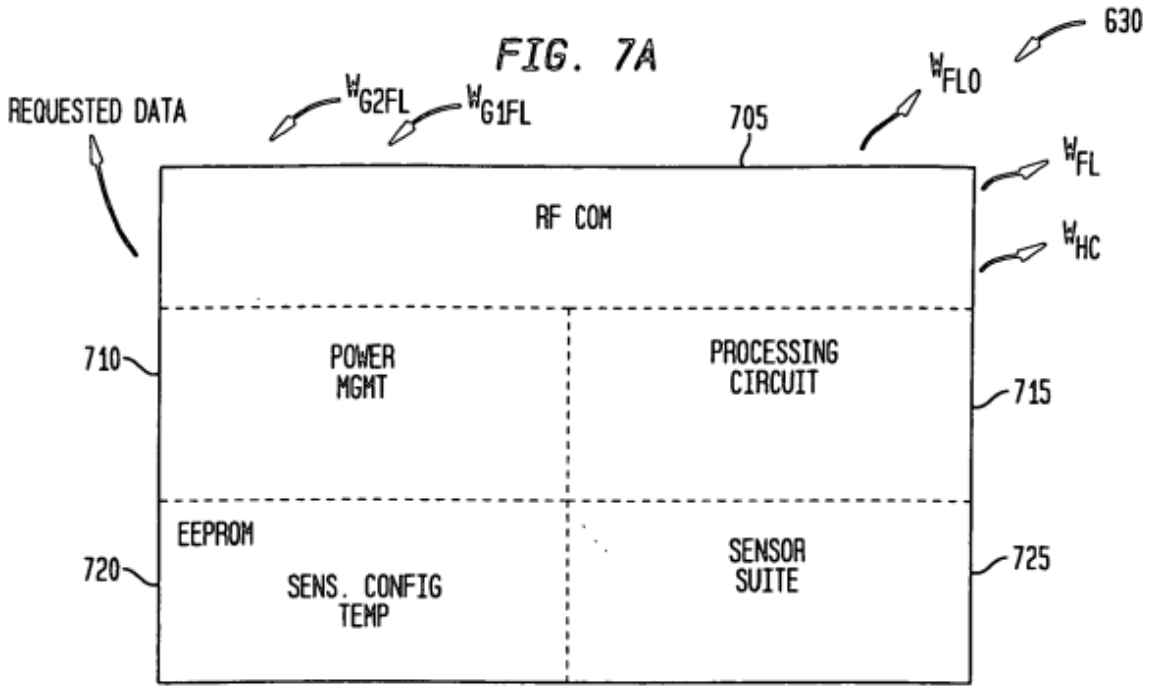
595. Therefore, for at least the reasons above, the components of McFarland wireless communication capabilities, and thus these modules include a wireless communication component as required by claim element 1[b]. Consequently, for at least the reasons above, it is my opinion that McFarland discloses the requirements of claim element 1[b] of the '282 patent.

596. Further, for at least the reasons detailed in relation to Section VI.C.i.c, Ahmed satisfies this claim element; and, because McFarland incorporates Ahmed '849 by reference, which has the same or substantially the same disclosure as Ahmed, as discussed in section V.B, for at least the same reasons McFarland also satisfies claim element 1[b].

597. For example, Ahmed '849 discloses wireless automation components, as discussed in relation to the preamble of claim 1 of the '282 patent, and thus these automation components satisfy the requirements of claim element 1[b] of including "a wireless communications component."

598. Indeed, Ahmed '849 discloses that each "sensor module," "actuator module," and "hub module" controller include "a wireless communication device" (*see* Ahmed '849, [0038], [0040], [0047], [0048], [0054], Fig. 7a). For example, in general, Ahmed '849 discloses that the controller hubs, sensor modules, and actuator modules of a space control subsystem each include local radio frequency communication capabilities, labeled "local RF Comm" in Ahmed '849 FIG. 2, and discloses that "sensor module 204 includes a MEMS local RF communication circuit 210" (Ahmed '849, [0040]) as well as describing that these modules utilize "a short-range or local RF communication scheme such as Bluetooth" (Ahmed '849, [0038]).

599. More specifically, figure 7a of Ahmed '849 (reproduced below) shows "a block diagram of a control module" (Ahmed '849, [0020]) that includes "an RF communication circuit 705" (Ahmed '849, [0117]; see also [0105]).



Reproduction of Ahmed '849 Figure 7a.

600. Therefore, for at least the reasons above, the modules of Ahmed '849 include RF communication capabilities implemented via an RF communication circuit, and thus these modules include a wireless communication component as required by claim element 1[b]. Consequently, for at least the reasons above, it is my opinion that Ahmed '849 discloses the requirements of claim element 1[b] of the '282 patent.

601. In addition, Liu discloses a wireless automation device, for example Liu describes an "apparatus compris[ing] one or more sensors for sensing conditions at the component or articles and producing one or more signals and a wireless transmitter for wirelessly transmitting data based on the one or more signals to a remote device" (Liu, Abstract). Liu additionally discloses "[t]he RF transceiver 36 [of the sensor apparatus], with the antenna 37, sends data to the hub 14 or other outer device, and may receive commands for controlling functions of the sensor node 10, 35. The antenna 37 may be, for example, an array of directional antennas and/or a multidirectional antenna" (Liu, [0042]). The multi-directional, wireless sensor units of Liu which can receive and follow

instructions constitutes automation components configured for wireless communication within a building automation system.

602. Thus, for at least the reasons detailed above, Liu discloses a wireless automation device as required by the preamble to claim 1 of the ’282 patent.

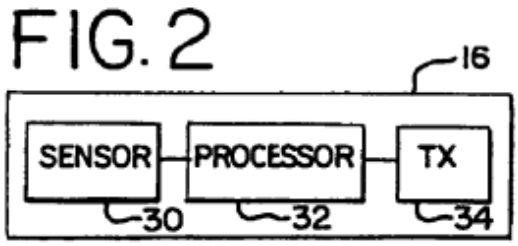
603. In addition to each of McFarland (including Ahmed ’849) and Liu individually disclosing the requirements of claim element 1[b] of the ’282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of these references which a POSITA would be motivated to make. More specifically, as detailed in Section VI.G.i, a POSITA would be motivated to incorporate the energy saving approach of Liu—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of McFarland, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the sensor modules of McFarland—which include a wireless communications component—are included within the combination of McFarland with Liu which a POSITA would be motivated to make, and therefore, for at least the reasons above, this combination satisfies the requirements of claim element 1[b].

d. **1[c] a processor in communication with the wireless communications component and the sensor package;**

604. This claim element requires a processor that is in communication with the wireless communications component of claim element 1[b] and the sensor package of element claim 1[a]. For at least the following reasons, McFarland discloses that the modules therein satisfy the requirements of claim element 1[c].

605. As detailed in relation to claim element 1[a] and 1[b], the sensor arrangement components of the automated building control systems of McFarland each include a multi-sensor package and

a wireless communications component. In addition, McFarland discloses that a processor is also within each module and that this processor is in communication with the wireless communications component and the sensor package.



Reproduction of McFarland Figure 2.

606. For example, McFarland discloses, in relation to an example sensor arrangement 16, that "[t]he sensor arrangement 16 includes a sensor 30, a sensor processor 32 and a transmitter 34" (McFarland, [0034], emphasis added). McFarland discloses a similar explanation in other portions of its disclosure, where it states "[a] sensor arrangement includes a sensor, a sensor processor and a radio frequency transmitter." (McFarland, [0011], emphasis added). McFarland further explains that "[t]he sensor performs control processes appropriate for the sensor and regardless of the type of actuator being used, and the output from the sensor is wirelessly communicated to an actuator." (McFarland, [0006], emphasis added).

607. Similarly, in relation to Figure 2 of McFarland—which, as discussed in relation to claim element 1[b], depicts a block diagram of an example sensor arrangement—McFarland states that "[t]he processor 32 is a general processor, digital signal processor, control processor, application specific integrated circuit, field programmable gate array, analog circuit, digital circuit, combinations thereof or other now known or later developed device for implementing a control process on a signal measured by the sensor 30," where "[t]he processor 32 has a processing power or capability and associated memory corresponding to the specific sensor 30 or corresponding to

the needs of one of a plurality of different types of sensors 30 with a maximum desired processing power, such as an 8 or 16 bit processor" (McFarland, [0036]).

608. McFarland further explains that "[t]he transmitter 34 is responsive to the processor 32 or other logic for increasing or decreasing transmitted power," or, "[a]lternatively, a set transmit power is used," and that "[t]he transmitter 34 is responsive to the processor 32 or other logic for changing a frequency, data format, interference avoidance technique or other transmission or reception property either automatically or in response to control signals" (McFarland, [0037]).

609. Thus, McFarland explicitly discloses that each sensor arrangement includes a processor that controls the operations of the module, and that the processor is in communication with both the wireless communication component and the sensors within the sensor suite (multi-sensor package). Consequently, for at least the reasons above, it is my opinion that McFarland discloses the requirements of claim element 1[c] of the '282 patent.

610. Further, for at least the reasons detailed in relation to Section VI.C.i.d, Ahmed satisfies this claim element; and, because McFarland incorporates Ahmed '849 by reference, which has the same or substantially the same disclosure as Ahmed, as discussed in Section V.B, for at least the same reasons McFarland also satisfies claim element 1[c].

611. As detailed above in relation to claim element 1[a] and 1[b], the modules of the space control subsystems of Ahmed '849 each include a multi-sensor package and a wireless communications component. In addition, Ahmed '849 discloses that a processor is also within each module and that this processor is in communication with the wireless communications component and the sensor package. For example, Ahmed '849 discloses, in relation to an example sensor module 204, that "sensor module 204 includes a MEMS local RF communication circuit

210, a microcontroller 212, a programmable non-volative [*sic*] memory 214, a signal processing circuit 216, and one or more MEMS sensor devices 218" (Ahmed '849, [0040], emphasis added).

612. Similarly, in relation to figure 7a of McFarland—which, as discussed in relation to claim element 1[b], depicts a block diagram of an example module—each "control module 630 includes an RF communication circuit 705, a power management circuit 710, a processing circuit 715, an EEPROM 720, and a sensor suite 725" (Ahmed '849, [0117]), wherein "[t]he processing circuit 1256 incorporates a microprocessor or microcontroller, as well as microelectronics A/D circuits for connecting to the MEMS sensor devices of the sensor suite 1252" (Ahmed '849, [0108]), where "processing circuit 1256 performs the operations described above in connection with the signal processing circuit 216 and controller 212 of the sensor module 204 of FIG. 2" (Ahmed '849, [0108]), and "processing circuit 1256 obtains the programming instructions from the RF communication circuit 1260 and stores the instructions into the EEPROM 1254" (Ahmed '849, [0112]).

613. Thus, Ahmed '849 explicitly discloses that each module includes a processor within the processing circuit, and that this processor controls the operations of the module. Moreover, the processor obtains instructions from the RF communication circuit, and provides A/D conversion for sensor inputs—i.e., the processor within processing circuit is in communication with both the wireless communication component (RF communication circuit) and the sensors within the sensor suite (multi-sensor package). Consequently, for at least the reasons above, it is my opinion that Ahmed '849 discloses the requirements of claim element 1[c] of the '282 patent.

614. In addition, Liu also discloses a wireless automation device in which control circuitry (i.e., a processor) in is communication with the wireless communications component and the sensor package. More specifically, in a description of figure 4 of Liu, Liu states "components of a

preferred sensor node 10 include: one or more sensors, for example digital and analog sensors 30, 32, for detecting environmental conditions around the structural component 12; an analog-to-digital converter 34 for converting signals from the analog sensors; control circuitry 35, for processing the signals from the sensors and producing a data stream, and may also decide what data if any will be transmitted, and/or take action based on commands from the hub 14 or the base 19, initiate a sleep mode, etc.; a radio-frequency (RF) transmitter 36 and an antenna 37, such as an antenna array for sending the data stream or receiving commands; timing circuitry 40, for timing the control circuit and/or the A-D converter; and a power source 42, for example with a voltage converter 44, providing power to the sensor node" (Liu, [0033], emphasis added). Therefore, it would be clear to a POSITA that the control circuitry 35 in a sensor unit of Liu would be in communication with a wireless communications component (i.e., RF transmitter 36 and corresponding antenna 37) and the sensors within the sensor suite (i.e., one or more sensors 30, 32), and that Liu consequently discloses the requirements of claim element 1[c].

615. In addition to each of McFarland (including Ahmed '849) and Liu individually disclosing the requirements of claim element 1[c] of the '282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of these references which a POSITA would be motivated to make. More specifically, as detailed in Section VI.G.i, a POSITA would be motivated to incorporate the energy saving approach of Liu—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of McFarland, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the sensor modules of McFarland—which include a processor that satisfies the requirements of claim element 1[c]—are included within the combination of McFarland with Liu

which a POSITA would be motivated to make, and therefore, for at least the reasons above, this combination satisfies the requirements of claim element 1[c].

616. Consequently, for at least the reasons above, it is my opinion that the combination of McFarland and Liu discloses the requirements of claim element 1[c] of the ’282 patent.

617. In addition, I note that Ollnova’s infringement contentions for claim element 1[c] do not address at all the requirement that a processor be “in communication with the wireless communications component and sensor package,” and instead Ollnova merely identifies a processor within the accused ecobee thermostat devices. Therefore, to the extent that Ollnova argues that the combination of McFarland and Liu does not disclose the requirements of claim element 1[c] due to some requirement associated with communication between the processor and the wireless communication component or sensor package, it should be noted that not only does this combination expressly describe a processor within the modules therein that both receives information from the RF communication circuit and processes sensor inputs, but also that Ollnova’s own contentions merely require the presence of a processor within a device that has sensors. In other words, not only does the combination of McFarland and Liu disclose the requirements of claim element 1[c] of the ’282 patent, but it also satisfies Ollnova’s own infringement contentions regarding this claim element.

e. **1[d] a memory in communication with the processor, the memory configured to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor; wherein the computer readable instructions are programmed to:**

618. McFarland discloses that the modules therein include a memory in communication with the processor, and for at least the reasons below McFarland discloses this memory being configured as required by claim element 1[d].

619. As shown, for example, in Figure 2 of McFarland, each sensor arrangement component includes a processor in communication with a sensor suite and a transmitter. McFarland further states that "[t]he sensor performs control processes appropriate for the sensor and regardless of the type of actuator being used, and the output from the sensor is wirelessly communicated to an actuator" (McFarland, [0006], emphasis added).

620. Similarly, in relation to figure 2 therein, McFarland states that "[t]he processor 32 is a general processor, digital signal processor, control processor, application specific integrated circuit, field programmable gate array, analog circuit, digital circuit, combinations thereof or other now known or later developed device for implementing a control process on a signal measured by the sensor 30," where "[t]he processor 32 has a processing power or capability and associated memory corresponding to the specific sensor 30 or corresponding to the needs of one of a plurality of different types of sensors 30 with a maximum desired processing power, such as an 8 or 16 bit processor" (McFarland, [0036], emphasis added). McFarland further states that "[b]y minimizing the processor requirements and associated memory, the cost of the sensor arrangement 16 may be reduced," where "[t]he processor 32 implements a control process algorithm specific to the sensor arrangement 16" (*Id*., emphasis added).

621. McFarland further explains that "[f]or example, a control algorithm is distributed on both a sensor processor 32 and an actuator processor 38 for performing a single or multiple functions," where "[t]he portion of the control algorithm corresponding to a specific device 16, 18, 20 is then operated or implemented at the specific device without the need of further control" (McFarland, [0043]). In this regard, "[t]he control algorithm for the temperature function with in [*sic*] the room is distributed on the different sensor arrangement 16 and actuator arrangements 20," and "[t]he

sensor arrangement 16 in this corresponding control algorithm outputs information specific to the sensing function without information indicating an act to be performed" (McFarland, [0043]).

622. A POSITA would recognize that the disclosed memory is utilized to store computer-readable instructions (e.g., the "control algorithm") for execution by the processor, as well as information utilized by the processor, at least because embedded memory is typically used in microprocessor systems for these purposes. In any event, McFarland expressly discloses that the memory of the sensor arrangement is in communication with the processor by explaining, at length, that this memory contains configuration information that is utilized by the processor, and the processor implements the disclosed functions of the disclosed system, including the processing of received information and the storage and transmission of sensor data. Accordingly, McFarland discloses "a memory in communication with the processor" as required by claim element 1[d] of the '282 patent.

623. Further, the storage of sensor data provided by the sensor package within the memory of the modules is inherent in the sensor modules, since these modules measure temperature and convert the signals for transmission (*see* McFarland, [0068]), which a POSITA would understand requires storage of the sensor data, at least temporarily, within a cache or other memory within the sensor module. More specifically, a POSITA would recognize that the disclosed memory within a sensor module is a convenient memory in which to store sensor data after this has been derived from analog sensor data and before it has been transmitted by the communication system. Moreover, a POSITA would understand that such storage is required since there is no guarantee that a transmission will occur exactly when data is acquired and thus storage of the sensor data is necessary at least until it is transmitted. This is consistent with McFarland's disclosure, since a POSITA would recognize that the function of a sensor module necessarily involves obtaining

sensor data and this data will necessarily need to be stored between acquisition and transmission. Therefore, a POSITA would recognize that storage of temperature values between their acquisition and subsequent transmission is required. Furthermore, the storage of sensor data within a sensor is a standard practice which would be expected by a POSITA as a normal feature in remote sensing devices required for their typical functionality.

624. Consequently, for at least the reasons above, it is my opinion that McFarland discloses the requirements of claim element 1[d] of the '282 patent. Furthermore, for at least the reasons detailed in relation to Section VI.C.i.e, Ahmed satisfies this claim element; and, because McFarland incorporates Ahmed '849 by reference, which has the same or substantially the same disclosure as Ahmed, as discussed in Section V.B, for at least the same reasons McFarland also satisfies claim element 1[d].

625. As shown in figure 2 of Ahmed '849, each of the modules within a space control subsystem include a nonvolatile memory (labeled as "NV MEM") in the figure. Indeed, in reference to an example embodiment, Ahmed '849 discloses that "sensor module 204 includes a MEMS local RF communication circuit 210, a microcontroller 212, a programmable non-volitive [*sic*] memory 214, a signal processing circuit 216, and one or more MEMS sensors devices 218" (Ahmed '849, [0040], emphasis added). Ahmed '849 as discloses that programmable non-volatile memory 214 "may be embodied as a flash programmable EEPROM" (Ahmed '849, [0044]), and figure 7a of Ahmed '849 clearly depicts this EEPROM memory as part of the module circuitry alongside a processing circuit and sensor suite.

626. A POSITA would recognize that the EEPROM is utilized to store programing for execution by the processor, as well as information utilized by the processor, at least because embedded EEPROM memory is typically used in microprocessor systems for these purposes. In any event,

Ahmed ’849 expressly discloses that the non-volatile memory of the modules is in communication with the processor by explaining, at length, that this memory contains configuration information that is utilized by the processor and that the processor can write into the memory—i.e., the memory is necessarily in communication with the processor. For example, Ahmed ’849 discloses that “[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information” (Ahmed ’849, [0047]). Accordingly, Ahmed ’849 discloses “a memory in communication with the processor” as required by claim element 1[d] of the ’282 patent.

627. The storage of sensor data provided by the sensor package within the non-volatile memory of the modules is inherent in the sensor modules, since these modules convert the analog signals from embedded MEMS sensor devices into digital signals for RF transmission, which a POSITA would understand requires storage of the sensor data, at least temporarily, within a cache or other memory within the sensor module. More specifically, a POSITA would recognize that the flash EEPROM memory within a sensor module is a convenient memory in which to store sensor data after this has been derived from analog sensor data and before it has been transmitted by the RF communication system. Moreover, a POSITA would understand that such storage is required since there is no guarantee that a transmission will occur exactly when data is acquired and thus storage of the sensor data is necessary at least until it is transmitted. This is consistent with Ahmed ’849’s explicit disclosure that “[t]he EEPROM 1254 also stores information related to the function in which the module 1200 will be used” (Ahmed ’849, [0109]), since a POSITA would recognize that the function of a sensor module necessarily involves obtaining sensor data and this data will necessarily need to be stored between acquisition and transmission. Indeed, Ahmed ’849 discloses

that "the microcontroller 212 determines whether it is time to transmit an updated temperature value to the hub module 202 … [t]he determination of when to transmit temperature values may be driven by a clock internal to the sensor module 204, or in response to a request or query received from the hub mobile 202, or both" (Ahmed '849, [0085]). Therefore, a POSITA would recognize that storage of temperature values between their acquisition and subsequent transmission is required. Furthermore, the storage of sensor data within a sensor is a standard practice which would be expected by a POSITA as a normal feature in remote sensing devices required for their typical functionality.

628. In addition, Ahmed '849 discloses that the non-volatile memory of the modules therein stores "computer readable instructions which are executable by the processor." Indeed, in general, the invention claimed within Ahmed '849 contemplates space control subsystems utilizing multiple different sensor modules that "have the same physical construction" wherein different sensor modules contain different "configuration information" to determine which of the multiple sensors therein are used by a given sensor module and how each sensor module operates within the control subsystem (*see*, e.g., Ahmed '849, [0052]). More specifically, Ahmed '849 discloses that "[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information" (Ahmed '849, [0047]). More specifically, in relation to the describing how a sensor module may be configured to be a temperature sensor by programming the configuration information, Ahmed '849 discloses that "[t]he microcontroller 212, responsive to the configuration information, causes the signal processing circuit 216 to process signals only from the temperature sensor, ignoring output from other sensors of the sensor suite 218" (Ahmed '849, [0049]). Moreover, Ahmed '849 explicitly

discloses that the configuration within the memory includes code required for the processor to utilize the applicable sensors for a specific purpose, stating "in one embodiment of the invention, most or all of the code unique to the selected function of the module is downloaded into the EEPROM 1254 during configuration of the device … [t]hus, if the module 1200 is to operate as a temperature sensor module, then all appropriate code for a temperature sensor module is downloaded to the EEPROM 1254" (Ahmed, [0011]). Thus, the configuration information stored within the memory includes instructions that are executed by the processor to determine how to operate the sensor module.

629. Consequently, for at least the reasons above, it is my opinion that Ahmed '849 discloses the requirements of claim element 1[d] of the '282 patent.

630. In addition, Liu also discloses a wireless automation device in which a memory is in communication with the processor, the memory configured to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor. More specifically, Liu states "[t]he control circuitry 35 preferably contains components suitable for receiving signals from the sensors 30, 32, processing the signals as necessary, and sending data to the hub 14 or another outer device" (Liu, [0039]). A POSITA would recognize that components suitable for receiving signals could include a memory in communication with the processor, and that configuring the control circuitry 35 to store sensor data within the memory, even temporarily, prior to evaluating that data would be an application-specific design choice. Thus, the instructions including a data threshold would be stored within the memory includes instructions that are executed by the controller to determine how to operate the sensor module.

631. Therefore, for at least the reasons above, it would be clear to a POSITA that memory could be implemented in a design choice to be in communication with the control circuitry 35 of Liu,

and that the controller and its associated memory may be programmed to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor, and that Liu consequently discloses the requirements of claim element 1[d].

632. In addition to each of McFarland (including Ahmed '849) and Liu individually disclosing the requirements of claim element 1[d] of the '282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of McFarland with Liu which a POSITA would be motivated to make. More specifically, as detailed in Section VI.G.i, a POSITA would be motivated to incorporate the energy saving approach of Liu—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of McFarland, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the sensor modules of McFarland—which include the required memory and store sensor data prior to transmission—are included within the combination of McFarland with Liu which a POSITA would be motivated to make, and therefore, for at least the reasons above, this combination satisfies the requirements of claim element 1[d].

633. In addition, I note that Ollnova's infringement contentions for claim element 1[d] do not address the requirement that a memory be "configured to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor," and instead Ollnova merely identifies that the ecobee accused products include memory. Therefore, to the extent that Ollnova argues that the combination of McFarland with Liu does not disclose the requirements of claim element 1[c] due to some requirement associated with how the memory is configured or what information is stored therein, it should be noted that not only does this combination expressly describe a memory that satisfies the requirements of claim element 1[d],

but also that Ollnova's own contentions merely require the presence of a memory. In other words, not only does the combination of McFarland with Liu disclose the requirements of claim element 1[d] of the '282 patent, but it also satisfies Ollnova's own infringement contentions regarding this claim element.

f. **1[e] receive sensor control information related to sensor data in control at a second automation component in communication with the building automation system; and**

634. As an initial matter, I understand the Court has construed the term "receive sensor control information related to sensor data in control at a second automation component in communication with the building automation system" to mean "receive information that identifies which sensor or sensor value is driving or controlling a second automation component in communication with the building automation system." I have applied this construction throughout my analysis.

635. McFarland discloses that in a second mode of operation, one or more sensor arrangements may receive control information from a second automation component in communication with the building automation system, such as a controller

636. For example, in relation to Figure 2 therein, McFarland states that "[t]he processor 32 has a processing power or capability and associated memory corresponding to the specific sensor 30 or corresponding to the needs of one of a plurality of different types of sensors 30 with a maximum desired processing power, such as an 8 or 16 bit processor" (McFarland, [0036], emphasis added). McFarland further states that "[b]y minimizing the processor requirements and associated memory, the cost of the sensor arrangement 16 may be reduced," where "[t]he processor 32 implements a control process algorithm specific to the sensor arrangement 16" (*Id*., emphasis added).

637. McFarland further explains that "[f]or example, a control algorithm is distributed on both a sensor processor 32 and an actuator processor 38 for performing a single or multiple functions," where "[t]he portion of the control algorithm corresponding to a specific device 16, 18, 20 is then operated or implemented at the specific device without the need of further control" (McFarland, [0043]). In this regard, "[t]he control algorithm for the temperature function with in [*sic*] the room is distributed on the different sensor arrangement 16 and actuator arrangements 20," and "[t]he sensor arrangement 16 in this corresponding control algorithm outputs information specific to the sensing function without information indicating an act to be performed" (McFarland, [0043]).

638. McFarland further discloses that "[i]n another mode of operation, the controllers override the sensor and/or actuators to alter processing based on a regional or larger area control process." (McFarland, [0027]; *see* also McFarland, Abstract, [0006], [0050]). The disclosed regional control or "override" by the controllers includes, for example, transmission of operation control instructions, instructions to direct certain sensor data, and communication settings, that are received by the sensor arrangements.

639. For example, McFarland states that transceiver 44 of controller 22 "is operable to send and/or receive information to and/or from any of the sensor arrangements 18, actuator arrangements 20, or other devices 18," where "[i]nformation from various ones of the devices 16, 18 and 20 may be received at the same or different times by the transceiver 44 for aggregate processing and routing by the processor 42" (McFarland, [0053]). McFarland further states that "[t]he transceiver 44 is also operable to transmit information to multiple or specific ones of the devices 16, 18, 20," where such information includes "[f]or example, binding associations, control instructions, communications settings or other information") (*Id*.).

640. McFarland further states that "[i]n overriding local control, the higher level wireless network 12 and controllers 22 are operable to instruct redirection of data, such as sensor data from the sensor arrangement 16 to the higher level wireless network 12" (McFarland, [0060]). McFarland also indicates that, "[a]s another alternative, the sensor and/or actuator arrangements 16, 20 request control input from one or more controllers 22" (*Id*.). As one example, an actuator may forward sensor data received from one or more sensor arrangements to a controller (alone or in the aggregate), whereafter "[t]he controller 22 outputs control instructions for the actuator arrangement 20 or another device or uses the transmitted information without further control output," and the actuator or other devices then performs tasks consistent with the control instructions received from the controller (*Id*., *see* also McFarland, [0061]).

641. With respect to use and redirection of sensor data, McFarland explicitly states that a controller transceiver "is operable to send and/or receive information to and/or from any of the sensor arrangements 18, actuator arrangements 20, or other devices 18," and that the transceiver "is also operable to transmit information to multiple or specific ones of the devices 16, 18, 20." (McFarland, [0053], emphasis added). McFarland further states that controllers may instruct one or more sensor arrangements to perform functions (e.g., adjust set point temperatures), and "[a]ny use of data from multiple sensors and/or actuators, such as data from multiple rooms or other aggregates of data outside of or different than the bindings established for the lower level wireless network 14, are performed by one or more controllers 22" (McFarland, [0062]).

642. Taken together, a POSITA would have understood McFarland's disclosures to describe one or more automation components (e.g., sensor arrangements 16) that may receive control information from a second automation component (e.g., controller 22) in communication with the building automation system, where such information may be an identification of sensor or sensor

values driving or controlling the second automation component (e.g., control information identifying of particular sensors or sensor data required by the controller, and that requires redirection to the controller for use by the controller and/or other components within the higher level wireless network). Accordingly, the sensor and actuator arrangements of McFarland "receive information that identifies which sensor or sensor value is driving or controlling a second automation component in communication with the building automation system," and it is my opinion that McFarland discloses the requirements of claim element 1[e] of the '282 patent.

643. For at least the reasons detailed in relation to Section VI.C.i.f, Ahmed satisfies this claim element; and, because McFarland incorporates Ahmed '849 by reference, which has the same or substantially the same disclosure as Ahmed, as discussed in Section V.B, for at least the same reasons McFarland also satisfies claim element 1[e].

644. As detailed in relation to claim 1[d], Ahmed '849 discloses "configuration information" that may be wirelessly received by a module within a space control subsystem to determine how the module functions. More broadly, also as detailed in relation to claim element 1[d], Ahmed '849 contemplates a network of multiple modules, where each module is the same but may be configured to perform different functions using stored configuration information that determines, for example, which sensors are utilized and how the processor operates the module. *See* claim element 1[d]. More specifically, Ahmed '849 discloses that each module therein "may readily be configured as any one of a large plurality of sensor types or even other types of building automation system components … reducing the per-unit tooling and design costs associated with ordinary building automation sensors … [i]t will be noted that the design of module 1200 may not only be used as the sensor modules 204, 206 in exemplary space control subsystem 200 of FIG. 2, but may also be used as the hub module 202" (Ahmed '849, [0113]). Thus, Ahmed '849 explicitly discloses

automation components within a building automation system in which each component may be configured, using configuration information received by the component, to perform a given subset of its possible functions and to perform in various roles required by the building automation system.

645. More generally, in reference to a module, Ahmed ’849 discloses that “[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information” (Ahmed ’849, [0047])—that is, Ahmed ’849 discloses that an automation component “receives” configuration information via its wireless communication device and that this received configuration information is stored in the memory and utilized by the processor to determine how to operate the automation component.

646. Further, the configuration information identifies “sensor or sensor value is driving or controlling a second automation component.” More specifically, Ahmed ’849 discloses that the configuration information determines which sensor or sensors are required for an automation component’s function (e.g., in relation to configuring a sensor module to operate as a temperature sensor as part of an HVAC system). Ahmed ’849 discloses “the EEPROM 704 may store information identifying that module 600 should enable its temperature sensing function as opposed to any of its other possible sensing functions” (Ahmed, [0109]).

647. Ahmed ’849 provides further details, disclosing that the microprocessor within a sensor module uses the configuration information “to cause the appropriate sensor device or devices from the sensor device suite 218 to be operable connected to the signal processing circuit such that sensed signals from the appropriate sensor device are digitized and provided to the microcontroller 212 … the microcontroller 212 may also use the configuration information to format outgoing

messages and/or control operation of the RF communication circuit 210" (Ahmed '849, [0047]). Moreover, in relation to the example embodiment where the sensor module is part of a HVAC control system, Ahmed '849 discloses that "[t]he microcontroller 212, responsive to the configuration information, causes the signal processing circuit 216 to process signals only from the temperature sensor, ignoring output from other sensors of the sensor suite 218" (Ahmed '849, [0049]). Thus, Ahmed '849 explicitly discloses that the configuration information, which is received by a module via the module's RF communication device, identifies the sensor or sensor values that the module should process and transmit.

648. Furthermore, Ahmed '849 describes that the example space control system of Fig. 2 is a kind of HVAC system in which "sensor module 204 is configured to enable its temperature sensing function" (Ahmed, [0042]), "sensor module 206 is configured to operate as a flow sensor" (Ahmed, [0052]), "actuator module 208 … is operable to control the position of a ventilation damper, thereby controlling the flow of heated or chilled air into the room" (Ahmed '849, [0053]), and "hub module 202 … performs the function of the loop controller (e.g., a PID controller) for the space control subsystem 110" (Ahmed '849, [0059]). Thus, Ahmed '849 discloses an example embodiment of a space control system where a temperature sensor, flow sensor, and damper actuator are coordinated via a controller to perform HVAC operations.

649. Accordingly, a POSITA would understand that the temperature sensor provides the inside temperature to the hub, which then determine whether or not adjustments to the actuator are required to enforce programmed temperature settings. Indeed, Ahmed '849 states that hub module 202 "obtains process variable values (i.e., sensor information) from either or both of the sensor modules 204 and 206 and generates control output values," "provides the control output values to the actuator module 208," and also "communicates with external elements of the building control

system, for example the supervisory computer, fan or chiller control subsystems, and other room controller subsystems" (Ahmed '849, [0059], *see also* Ahmed '849, [0069]).

650. Therefore, at least because Ahmed '849 explicitly contemplates the use of multiple similar modules which are configured to perform a particular role by configuration information programmed into each module memory, and because the sensor modules are connected to the supervisory computer via the hub modules, each sensor module receives configuration information from a hub module to cause it to function as required by the hub. More specifically, when configuring a space control subsystem of Ahmed '849 for its purpose, the appropriate configuration information must be transmitted to each sensor module from the hub. Indeed, a POSITA would understand configuration could be achieved via the supervisory computer—which facilitates network management and coordination of communication of data and control signals (Ahmed '849, [0082]). Thus, Ahmed '849 discloses that a module configuration, which a POSITA would understand involves, for example, a controller requisitioning required sensor modules for its assigned control processes via distributing corresponding configuration information.

651. Consequently, for at least the reasons above, the configuration information of Ahmed '849 is received by sensor modules within space control subsystems from hub modules within the same building control system, and this configuration information is used by the sensor modules to identify which sensor values are required to be transmitted to the hub module. Accordingly, the modules of Ahmed '849 "receive information that identifies which sensor or sensor value is driving or controlling a second automation component in communication with the building automation system," and it is my opinion that Ahmed '849 discloses the requirements of claim element 1[e] of the '282 patent.

652. In addition to McFarland (including Ahmed ’849) individually disclosing the requirements of claim element 1[e] of the ’282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of McFarland with Liu which a POSITA would be motivated to make. More specifically, as detailed in Section VI.G.i, a POSITA would be motivated to incorporate the energy saving approach of Liu—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of McFarland, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the combination of McFarland with Liu which a POSITA would be motivated to make includes the reconfigurable modules of McFarland which utilize “configuration information” in a way that satisfies the limitations of claim element 1[e], and therefore, for at least the reasons above, this combination satisfies the requirements of claim element 1[e].

653. In addition, I understand that Ollnova’s infringement contentions for claim element 1[e] do not address the requirements set forth in the Court’s claim construction, which are reflected in the patent specification, and instead Ollnova merely identifies that the ecobee accused products receive certain information, such as parameter updates. Therefore, to the extent that Ollnova argues that the combination of McFarland and Liu does not disclose the requirements of claim element 1[e] due to some requirement associated with sensor control information, it should be noted that not only does the combination of McFarland and Liu expressly describe information that satisfies the requirements of claim element 1[e], but also that Ollnova’s own contentions merely require the reception of information concerning, e.g., parameter updates, without necessarily including the features required by the Court’s construction. In other words, not only does the combination of McFarland and Liu disclose the requirements of claim element 1[e] of the ’282 patent, but it also

satisfies Ollnova's own infringement contentions regarding this claim element as I understand them.

g. **1[f] communicate a portion of the stored sensor data corresponding to the received sensor control information to the second automation component.**

654. For at least the reasons detailed in relation to claim element 1[e], a sensor arrangement of McFarland (i.e., an example "automation component") communicates a portion of its stored data corresponding to the received sensor control information from a controller (i.e., an example "second automation component") within the same building automation system. More specifically, as detailed in relation to previous claim elements of claim 1, each sensor arrangement within a building automation system of McFarland receives control information, which may be wirelessly transmitted to each sensor arrangement from one or more controllers; this configuration information is used by each sensor module to identify which sensor or sensor data is needed by the controller (or other high level network components) for control processes, and the corresponding sensor data is transmitted.

655. Consequently, for at least the reasons above, it is my opinion that McFarland discloses the requirements of claim element 1[f] of the '282 patent. Furthermore, for at least the reasons detailed in relation to Section VI.C.i.g, Ahmed satisfies this claim element; and, because McFarland incorporates Ahmed '849 by reference, which has the same or substantially the same disclosure as Ahmed, as discussed in Section V.B, for at least the same reasons McFarland also satisfies claim element 1[f].

656. For at least the reasons detailed in relation to claim element 1[e], a sensor module of Ahmed '849 (i.e., an example "automation component") communicates a portion of its stored data corresponding to the received sensor control information from a controller hub (i.e., an example "second automation component") within the same building automation system. More specifically,

as detailed in relation to previous claim elements of claim 1, each sensor module within a space control subsystem of the building automation system of Ahmed ’849 receives “configuration information,” which may be wirelessly transmitted to each sensor module from a controller hub; this configuration information is used by each sensor module to identify which of several different kinds of available sensor data is needed by the hub for the hub’s control processes, and the corresponding sensor data is transmitted to the controller hub.

657. Consequently, for at least the reasons above, it is my opinion that Ahmed ’849 discloses the requirements of claim element 1[f] of the ’282 patent.

658. In addition to McFarland (including Ahmed ’849) individually disclosing the requirements of claim element 1[e] of the ’282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of McFarland with Liu which a POSITA would be motivated to make. More specifically, as detailed in Section VI.G.i, a POSITA would be motivated to incorporate the energy saving approach of Liu—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of McFarland, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the combination of McFarland with Liu which a POSITA would be motivated to make includes the reconfigurable modules of McFarland which utilize “configuration information” to identify which sensor values should be communicated as required by claim element 1[f], and therefore, for at least the reasons above, this combination satisfies the requirements of claim element 1[f].

659. Therefore, for all of the reasons above, it is my opinion that McFarland and Ahmed '849, which is incorporated into McFarland by reference, in combination with Liu discloses or renders obvious to a POSITA each and every limitation of claim 1 of the '282 patent.

iii.Claim 3

660. Claim 3 of the '282 Patent recites:

> The automation component of claim 1, wherein the computer readable instructions are further programmed to: identify sensor values within the sensor data that exceed a corresponding change-of-value threshold.

661. Claim 3 of the '282 depends upon claim 1 therein, and includes additional limitations pertaining to the identification of sensor values within the stored sensor data that exceeds a change-of-value threshold. For at least the reasons detailed above in relation to claim 1, it is my opinion that the combination of McFarland with Liu discloses each and every limitation of claim 1 of the '282 patent; and, for at least the reasons below, it is my opinion that the combination of McFarland and Liu also renders obvious the limitations added to this claim by claim 3.

662. As detailed in relation to claim 1[d], McFarland discloses control information that may be wirelessly received by a sensor arrangement within a building automated control system to determine how the sensor arrangement functions. More broadly, also as detailed in relation to claim element 1[d], McFarland contemplates a network of multiple wireless components (e.g., sensors and actuators), where each component contains similar hardware and may be configured to perform different functions using stored configuration information that determines, for example, which sensors are utilized and how the processor operates the module. *See* claim element 1[d]. In particular, Ahmed discloses that "[f]or example, a control algorithm is distributed on both a sensor processor 32 and an actuator processor 38 for performing a single or multiple functions," where "[t]he portion of the control algorithm corresponding to a specific device 16, 18, 20 is then

operated or implemented at the specific device without the need of further control." (McFarland, [0043]). In this regard, "[t]he control algorithm for the temperature function with in [*sic*] the room is distributed on the different sensor arrangement 16 and actuator arrangements 20," and "[t]he sensor arrangement 16 in this corresponding control algorithm outputs information specific to the sensing function without information indicating an act to be performed" (McFarland, [0043]). Thus, McFarland explicitly discloses automation components within a building automation system in which each component may be configured, using configuration information received by the component, to perform a given subset of its possible functions and to perform in various roles required by the building automation system.

663. Further, Ahmed '849, whose disclosure is expressly incorporated into McFarland, discloses "configuration information" that may be wirelessly received by a module within a space control subsystem to determine how the module functions. More broadly, also as detailed in relation to claim element 1[d], Ahmed '849 contemplates a network of multiple modules, where each module is the same but may be configured to perform different functions using stored configuration information that determines, for example, which sensors are utilized and how the processor operates the module. *See* claim element 1[d]. More specifically, Ahmed '849 discloses that each module therein "may readily be configured as any one of a large plurality of sensor types or even other types of building automation system components … reducing the per-unit tooling and design costs associated with ordinary building automation sensors … [i]t will be noted that the design of module 600 may not only be used as the sensor modules 204, 206 in exemplary space control subsystem 200 of FIG. 2, but may also be used as the hub module 202" (Ahmed '849, [0113]). Thus, Ahmed '849 explicitly discloses automation components within a building automation system in which each component may be configured, using configuration information

received by the component, to perform a given subset of its possible functions and to perform in various roles required by the building automation system.

664. As previously also discussed for claim 1[d], the sensor arrangement disclosed in McFarland discloses what a POSITA would recognize as a memory in communication with the processor that can be used for the storage of sensor data collected by these disclosed sensors. McFarland also discloses that its design is intended to achieve energy savings, including with respect to performing tasks only when necessary (see, e.g., McFarland, [0009], [0086], [0191]). Further, the module within a space control subsystem of Ahmed '849 discloses what a POSITA would recognize as a memory in communication with the microcontroller that can be used for the storage of sensor data, at least temporarily in flash memory, collected by the one or more MEMS sensors devices. A POSITA would be motivated to incorporate the energy saving approach of Liu into the control information of McFarland, and the configuration information of Ahmed—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of Ahmed, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. By introducing the power saving aspects of Liu into the BAS disclosed in McFarland and Ahmed '849, specifically that in which sensor readings are evaluated against sensor value threshold criteria upon waking up from a sleep, or otherwise transitioning from a periodic low power mode, prior to the transmission of the sensor data. More generally, it would be straightforward to a POSITA that one possible method of evaluating sensor value data to make a determination of whether or not to transmit the data to an external unit would be to compare the sensor reading against, for example, sensor value threshold criteria, which could be easily programmed into the sensor modules. It therefore becomes obvious to a POSITA to identify sensor

values at regular intervals and evaluate them against previously collected readings to determine anomalous environmental conditions or changes of value during the sleep interval. Indeed, McFarland itself recognizes energy savings that can be gained by intermittently energizing circuitry as needed (see McFarland, [0086]). In other words, generally, the approach of Liu involves the sensor unit determining whether or not to transmit sensor data based on some condition, for example threshold criteria, to increase battery life by limiting transmission of data; and, it would be obvious to a POSITA that the sensor modules of McFarland could similarly benefit in the same way by incorporating the same kind of determination of whether or not to transmit sensor data at least because the sensor modules of McFarland and Ahmed '849 contain the required processing capabilities and would benefit in the same way as the sensor units of Liu from reduced energy use.

665. In particular, Liu discloses that in order to conserve power, if a "sleep mode is entered 94, and the sensor node 10, 50 waits for a signal to wake, which may be at a particular time, after a particular time interval, or upon receipt of an outside signal," and that "[o]nce awakened, the sensor node 10, 50 receives (step 70) a new signal input from the sensor 30, 32" (Liu, [0049]), which would then be processed and evaluated by the control circuitry 35 to determine whether to not to transmit the data to another unit. Broadly, this power saving functionality demonstrates that the teachings of Liu allows for automation components comprising sensors to elongate battery life by only checking the values of sensors at regularly defined intervals, which occur at "a particular time" or "after a particular time interval."

666. Liu explicitly states that "[t]he health and status of civil structures, for example, may be monitored using sensor nodes for scheduling routine maintenance or to assist in emergencies" (Liu, [0024]). It would be well known to a POSITA that a common and safety-critical application for

the detection of environmental conditions would be for the notification of an adverse condition during emergencies (e.g., fire, earthquake, etc.). As such, it would be clear and desirable for a POSITA to include instructions within the programmable control circuit 35 that would evaluate the environmental condition sensor readings against threshold criteria that would indicate whether such a threshold has been exceeded in order to determine if the data should be transmitted to external units. In other words, in order for the detection of an anomalous environment condition to be communicated from the sensor unit, such an anomaly must be detected, which would require the identification of sensor values when it takes readings, and an evaluation of those readings against a set of criteria that would determine if the reading was, in fact, anomalous.

667. More specifically, it would be known to a POSITA that there is a finite number of threshold choices available for such an application: (1) a high threshold (i.e., exceed a high threshold); (2) a low threshold (i.e., subceed a low threshold); (3) within a range of values (i.e., outside an inner range threshold); (4) not within a range of values (i.e., inside an outer range threshold); and (5) a combination of the previous options. Moreover, a POSITA would understand that the threshold choice above could be applied to *absolute* values (i.e., fixed, predetermined thresholds) or to *relative* values (i.e., thresholds that depend on the previous or current measured values). Indeed, it is obvious to a POSITA that one criterion that grants the benefits of Liu (i.e., reduced transmission energy usage by selective determination of when to transmit data) could be implemented using a relative application of choice (4) such that data is only transmitted when a meaningful change is detected. This would, for example, increase the battery life of a temperature sensor by preventing repeated transmission of the same temperature when a room's temperature is stable; because an HVAC system only needs to act when temperature changes, there is no need for a constant

temperature to be repeatedly transmitted and thus the system of Liu achieves its goal of reducing transmission of data without effecting how the HVAC system operates.

668. In more detail, to effectively determine when a sensor reading has changed from that of a previous reading, it would be obvious to a POSITA that a small inner range threshold would be used. For example, if a temperature has a set point of a certain value, an inner range threshold criteria could be plus or minus one degree. Thus, if a temperature reading within a space control subsystem is taken that falls outside of this narrow range, then the system would detect a change-of-value from the set point, and the condition would be reported to the base unit or a second automation component to maintain the system to operate as intended. As such, a POSITA would be motivated to implement an inner rage threshold as a change-of-value threshold into the BAS of McFarland (and Ahmed '849). In other words, using the inner range threshold criteria within the BAS of McFarland (and Ahmed '849) could be used to make the determination to send an alert if a measurement is outside a predefined range, which would be obvious to a POSITA interested in maintaining a system at particular sensor reading values while checking readings periodically, in view of Liu's emphasis on energy efficiency.

669. Thus, by programming the power saving functionality of Liu into the configuration information of the reconfigurable modules of McFarland (and Ahmed '849), a POSITA could easily program an inner range threshold by which sensor values could be detected as different from previous values of the same sensor. Consequently, for at least the reasons above, it is my opinion that McFarland in view of Liu discloses the requirements of claim 3 of the '282 patent.

iv.Claim 6

670. Claim 6 of the '282 Patent recites:

> The automation component of claim 1, wherein all of the stored sensor data is communicated at a regular interval.

671. Claim 6 of the ’282 depends upon claim 1 therein, and includes additional limitations pertaining to periodic transmission of all stored sensor data. For at least the reasons detailed above in relation to claim 1, it is my opinion that the combination of McFarland with Liu discloses each and every limitation of claim 1 of the ’282 patent; and, for at least the reasons below, it is my opinion that the combination of McFarland and Liu also renders obvious the limitations added to this claim by claim 6.

672. As discussed in VI.G.ii, McFarland discloses that sensor data stored in one or more sensor arrangements may be transmitted at set times. And, as discussed in VI.G.ii, Ahmed ’849 discloses periodic transmission of sensor data from sensor modules. Both McFarland and Ahmed ’849 disclose that information (e.g., “control” or “configuration” information) determine which sensor data is transmitted from each sensor module (*see* claim 1), and a POSITA would recognize that configuration such that all of the stored sensor data is transmitted is merely an application-specific design choice. For instance, if the sensor module included, e.g., temperature, humidity, and occupancy sensors it would be obvious to a POSITA that all of the sensor data may be utilized by an HVAC system such that, for example, room temperature could be controlled based on humidity and occupancy—e.g., lower temperatures may be desirable for higher humidity temperatures to optimize comfort, and different comfort or zoning considerations may be applied based on which rooms are occupied.

673. Consequently, for at least the reasons above, it is my opinion that claim 6 of the ’282 patent is obvious to a POSITA in view of McFarland.

674. In addition to McFarland (and Ahmed ’849) individually disclosing the requirements of claim 6 of the ’282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of McFarland with Liu which a POSITA would be motivated to make. More

specifically, as detailed in Section VI.G.i, a POSITA would be motivated to incorporate the energy saving approach of Liu—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of Ahmed, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the combination of McFarland with Liu which a POSITA would be motivated to make includes the reconfigurable modules of Ahmed which utilize "configuration information" to communicate all sensor values at regular intervals as required by claim 6 and therefore, for at least the reasons above, this combination satisfies the requirements of claim 6.

v.Claim 20

675. Claim 20 of the '282 Patent recites:

> A method for providing power saving wireless communication within a building automation system, the method comprising:
>
> scanning sensor data associated with each of a plurality of sensors contained within a multi-sensor package of a first automation component;
>
> identifying changed sensor values within the sensor data;
>
> receiving a first communication from a second automation component in communication with the first automation component and the building automation system; and
>
> communicating a portion of the identified changed sensor values associated with the first communication received from the second automation component

676. Thus, claim 20 of the '282 patent is directed towards a method for wireless automation component within a building automation system, and includes limitations pertaining to selective communication of sensor data between different automation components within the building automation system. For at least the reasons detailed below, each and every limitation of claim 20

of the ’282 patent is obvious to a POSITA in view of the combination of McFarland with Liu detailed in Section VI.G.i.

a. **20[pre] A method for providing power saving wireless communication within a building automation system, the method comprising:**

677. To the extent that the preamble of claim 20 of the ’282 is limiting, McFarland in view of Liu discloses a method incorporating power saving for an automation component configured for wireless communication within a building automation system for at least the following reasons.

678. McFarland discloses a system comprising a “lower level network” and a “high level network,” comprising wireless communications networks, (McFarland, [0028]), which includes components configured for wireless communication equipped to control building automation. With respect to Figure 1, McFarland states “[o]ne of the wireless networks 12 is a high level control network, and the other wireless network 14 is a lower level operations network.” More specifically, McFarland discloses, with respect to Figure 1 shown therein, a block diagram of a multi-tier wireless building automation control system architecture (McFarland, [0019]), including sensor arrangements (16) configured for communication with actuator arrangements (20), and controller (22), each of which constitute wireless automation components configured for wireless communication within a building automation system. (*see*, e.g., McFarland at Abstract; [0002]-[0004], [0006], [0010], [0026]). McFarland states in its Abstract, for example, that “[o]n a first level of the wireless building automation architecture, sensors and associated actuators communicate directly,” where “[t]he sensor performs control processes appropriate for the sensor and regardless of the type of actuator being used,” and “[t]he actuator performs control processes specific to the actuator regardless of the type of sensor being used” (McFarland at Abstract). In particular, McFarland explains

> [t]he sensor reports information appropriate or specific to the sensor, such as reporting the result of a comparison of a measured value to a desired or set point value. Actuators use the output sensor data to provide a response appropriate for the actuator. Controllers monitor the process or action of sensors and actuators without control in one mode of operation. In another mode of operation, the controllers override the sensor and/or actuators to alter processing based on a regional or larger area control process (McFarland, [0031], see also, e.g., [0050]-[0054]; [0056]-[0057]).

679. Figure 1 and Figure 5 of McFarland, reproduced below, illustrate exemplary arrangements of automation components of the disclosed system in a building automation system.

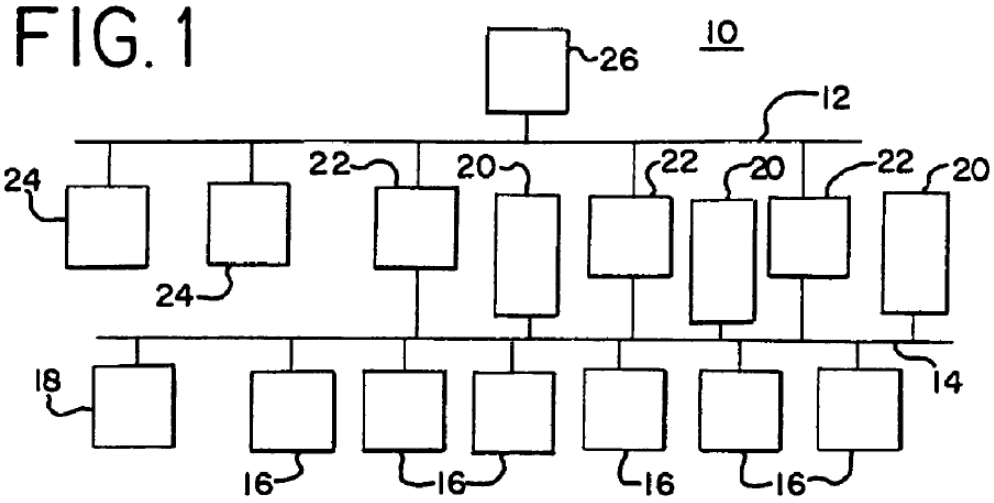


Figure 6. Reproduction of McFarland figure 1.

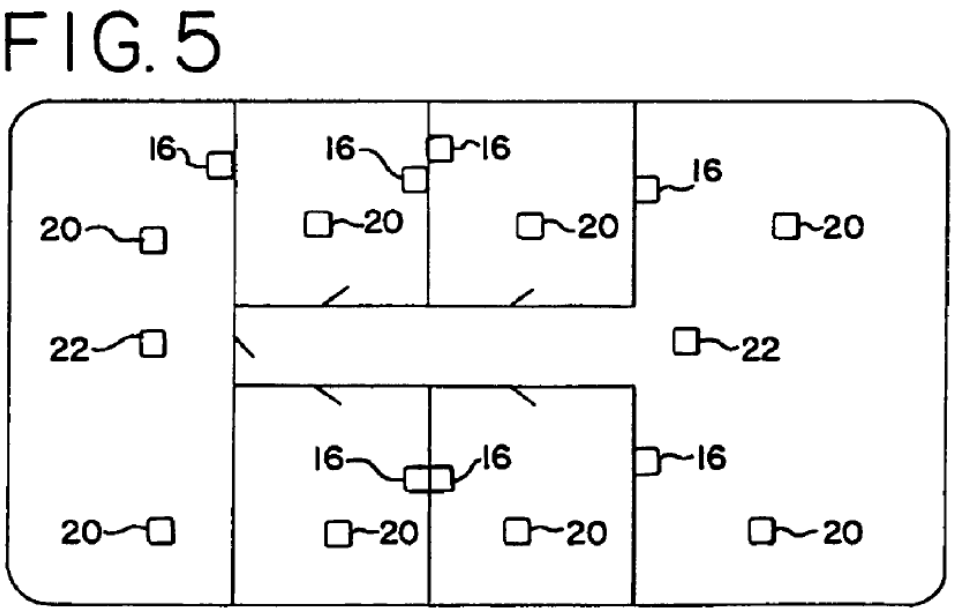


Figure 7. Reproduction of McFarland figure 5.

680. Figures 2, 3 and 4 of McFarland shows block diagrams of exemplary automation components (sensor arrangement, actuator arrangement, controller) that wirelessly communicate and operate within its disclosed system:

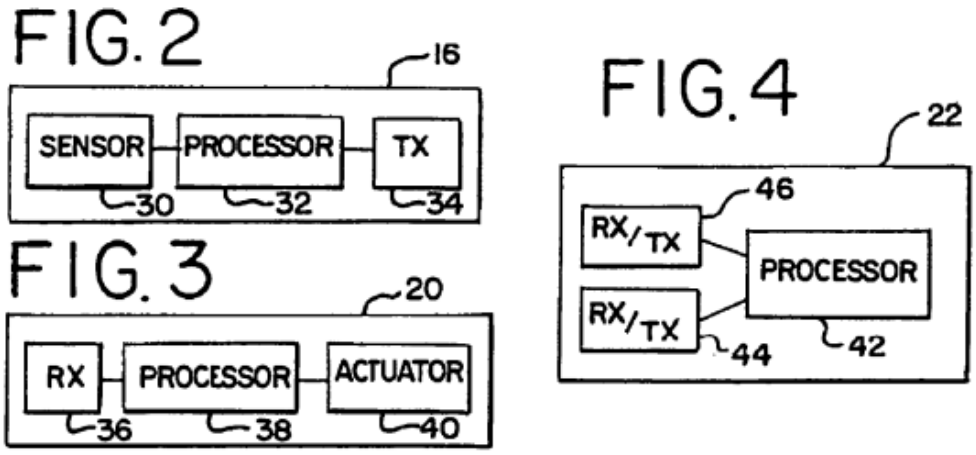


Figure 8. Reproduction of McFarland figures 2, 3 and 4.

681. McFarland discloses that such sensor, actuators, and controllers may each include processors as well as transceivers for transmitting and/or receiving wireless communications signals. For example, McFarland explains that sensor arrangement 16 "includes a sensor 30, a sensor processor 32 and a transmitter 34," where "transmitter 34 is a radio frequency transmitter"

(McFarland, [0034], [0037]). McFarland further explains that actuator arrangement 20 "includes a receiver 36, an actuator processor 38 and an actuator 40," where "receiver 36 is a radio frequency receiver" (McFarland, [0038]-[0039]). McFarland further explains that controller 22 "include one or more processors 42 and two transceivers 44, 46," where "[o]ne transceiver 44 is operable for connecting with the lower level network 14," and "transceiver 46 is operable to transmit and receive information to and from other controllers 22, or other devices 24 and 26 of the high level wireless network 12" (McFarland, [0052]-[0054]).

682. McFarland discloses that "in one embodiment, sensor arrangements 16, other devices 18 and/or the actuator arrangements 20 operate as full function devices of 802.15.4 allowing for dynamically assigned communications with different devices over a single or multiple communications path but without the ability to route routing communications from other devices." (McFarland, [0033]). McFarland further explains that "transmissions addressed to other devices, such as one or more of the controllers 22 are also transmitted," where "receiving controller 22 then routes the signals to the desired or addressed controller 22" (*Id*.). McFarland further states that "[c]ontrollers associated with the sensors and actuators perform the automation without a separate controller for managing or providing control instructions for the building automation or environment function" (McFarland, [0067]; *see also* [0076-0077]).

683. McFarland also discloses that its design is intended to achieve energy savings when implemented, including with respect to performing tasks only when necessary (see, e.g., McFarland, [0009], [0086], [0191]).

684. Thus, for at least the reasons detailed above, to the extent the preamble is limiting, McFarland discloses a "power saving wireless communication within a building automation system." Furthermore, for at least the reasons detailed in relation to Section VI.E.v.a, Ahmed

satisfies this claim element; and, because McFarland incorporates Ahmed '849 by reference, which has the same or substantially the same disclosure as Ahmed, as discussed in section V.B, for at least the same reasons McFarland also satisfies claim element 20[pre].

685. For example, Ahmed '849 discloses a wireless network of automation components within a building. The abstract of Ahmed '849 describes "[a]n apparatus for use in a building system includes at least one microelectromechanical (MEMS) sensor device and a processing circuit that are integrated onto a single substrate," wherein "at least one MEMs sensor device is operable to generate a process value … [t]he processing circuit is operable convert the process value to an output digital signal configured to be communicated to another element of a building automation system … [and] [t]he building automation system includes one or more devices that are operable to generate a control output based on set point information and process value information from one or more sensors" (Ahmed '849 at Abstract).

686. Ahmed '849 discloses equivalent material compared to Ahmed. In particular, Ahmed '849 also discloses the same block diagrams that are disclosed in Ahmed, as Figure 1 and Figure 2, reproduced below.

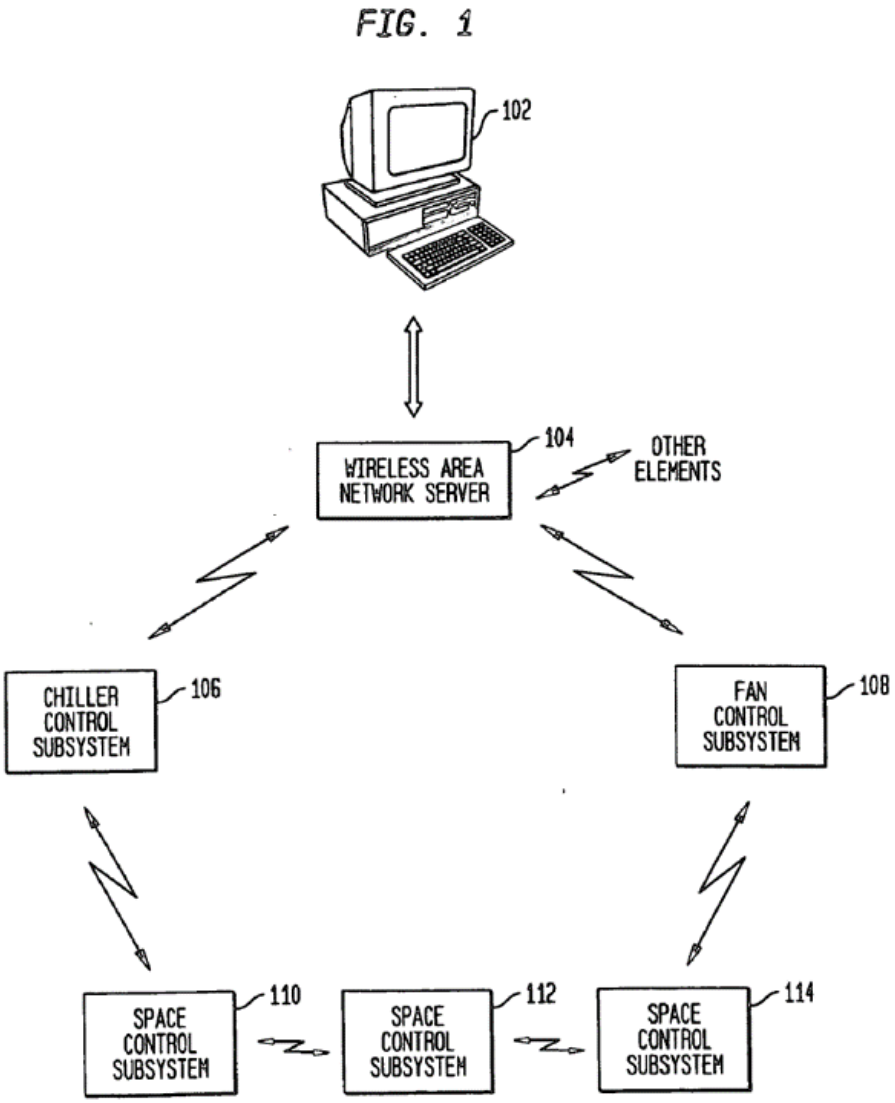


Figure 9. Reproduction of Ahmed '849 Figure 1.

687. Figure 1 of Ahmed '849 shows a block diagram of an exemplary building control system in which a supervisory computer is communicatively coupled to building subsystems via a wireless area network.

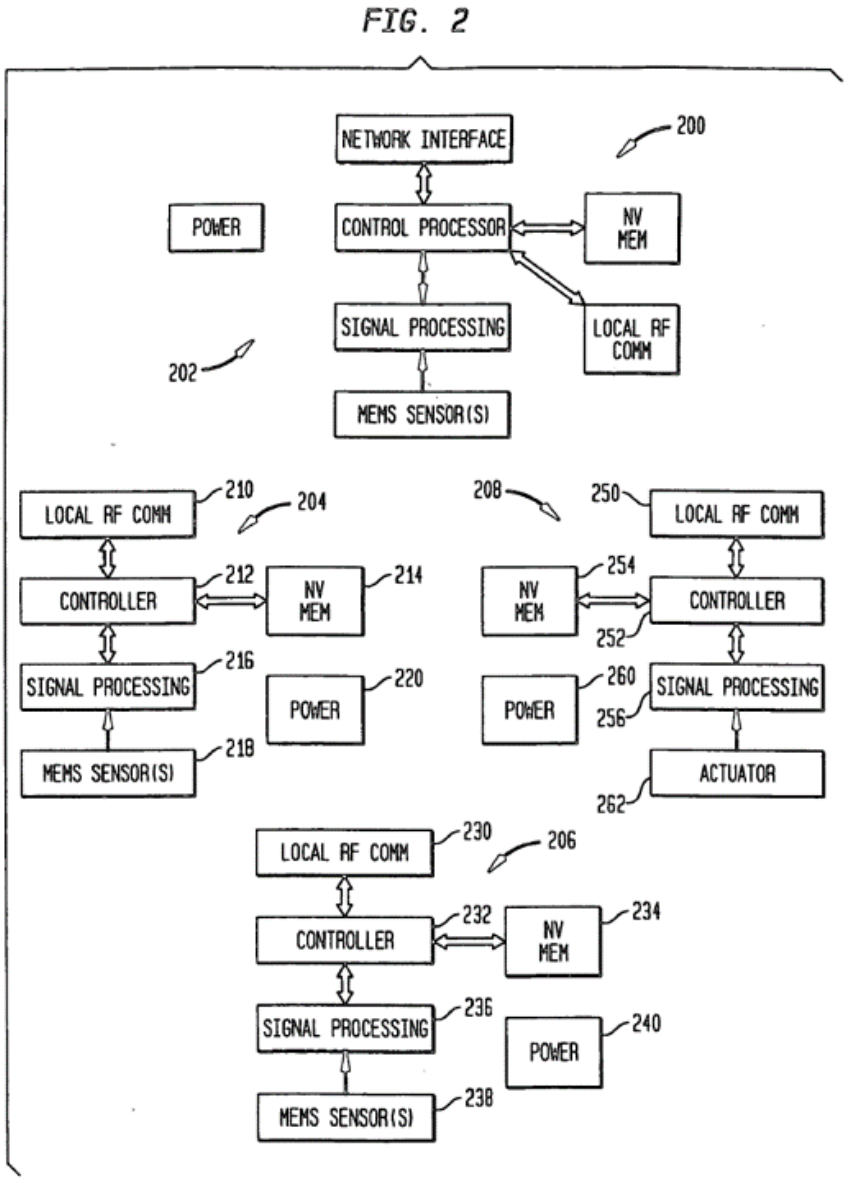


Figure 10. Reproduction of Ahmed '849 Figure 2.

688. Figure 2 of Ahmed '849 shows a "block diagram of an exemplary room control system that may be used as the space control subsystems 110" (Ahmed '849, [0038]), depicted in Figure 1. Each space control subsystem includes a "hub module 202," two "sensor modules 204 and 206," and one "actuator module 208" (Ahmed '849, [0029]). In an example embodiment discussed within Ahmed '849, the room control system of figure 2 is configured to control HVAC equipment whereby "[t]he first sensor module 204 represents a temperature sensor module and is preferably

embodied as a wireless integrated network sensor" (Ahmed '849, [0039]), "[t]he sensor module 206 is configured to operate as a flow sensor" (Ahmed '849, [0052]), and "[t]he actuator module 208 … is operable to control the position of a ventilation damper, thereby controlling the flow of heated or chilled air into the room" (Ahmed '849, [0053]).

689. Thus, each of modules 202, 204, 208, and 206 constitutes example "automation components" as required by claim 1 of the '282 patent. Moreover, the hub module 202 including a "network interface" to communicate with other hub devices as well as "local RF comm" to wirelessly communicate with other modules. The modules 204, 208, and 206 also include "local RF comm" to allow wireless communication between modules. Additionally, Ahmed '849 describes these modules as constituting parts of a building control system which function to autonomously control the environment within "spaces" or "rooms" in a building. Therefore, Ahmed '849 discloses automation components that are part of a wireless communication within a building automation system.

690. In addition, to the extent that the preamble of claim 1 of the '282 Patent is limiting, Liu also discloses an automation component configured for wireless communication within a building automation system for at least the following reasons.

691. Liu discloses a wireless automation device, for example Liu describes an "apparatus compris[ing] one or more sensors for sensing conditions at the component or articles and producing one or more signals and a wireless transmitter for wirelessly transmitting data based on the one or more signals to a remote device" (Liu, Abstract). Moreover, Liu discloses a system for autonomous reporting of environmental conditions which may be programmed to perform an alarm functionality, for example (*see,* e.g., Liu, [0048]). Liu additionally discloses "[t]he RF transceiver 36 [of the sensor apparatus], with the antenna 37, sends data to the hub 14 or other

outer device, and may receive commands for controlling functions of the sensor node 10, 35. The antenna 37 may be, for example, an array of directional antennas and/or a multidirectional antenna" (Liu, [0042]). The multi-directional, wireless sensor units of Liu which can receive and follow instructions constitutes automation components configured for wireless communication within a building automation system. Thus, for at least the reasons above, Liu discloses the requirements of the preamble of claim 1 of the '282 patent to the extent these are limiting.

692. In addition to each of McFarland (including Ahmed '849) and Liu individually disclosing the requirements of the preamble of claim 1 of the '282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of these references which a POSITA would be motivated to make. More specifically, as detailed in Section VI.G.i, a POSITA would be motivated to incorporate the energy saving approach of Liu—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of McFarland, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the combination of McFarland and Liu which a POSITA would be motivated to make includes the sensor modules of McFarland with the power saving functionality of Liu, which, for at least the reasons detailed above, satisfy the requirements of the preamble of claim 20 of the '282 patent.

693. Consequently, for at least the reasons above, to the extent that the preamble of claim 1 of the '282 patent is limiting, it is my opinion this preamble is rendered obvious to a POSITA in view of the combination of McFarland with Liu.

694. In addition, regarding the claim term "[first/second] automation component," to the extent that this term applies to the "an automation component" of the claim 20 preamble I have applied

the Court's construction for this term in forming my opinions. More specifically, the Court has ordered that the term "[first/second] automation component" be construed to mean "[first/second] component designed to operate without human interaction in an automation system" and I have applied this construction in my analysis. The modules of McFarland (including Ahmed '849) are used within a building control system to autonomously control the environment within a room of the building by operating actuator modules based on information from sensor modules, and thus operate without human interaction when performing their usual function. Similarly, the sensor units of Liu operate within an autonomous system for detecting environmental conditions without human interaction until programming instructs the component to transmit data. In any event, McFarland discloses a control subsystem consisting of sensors, actuators, and controllers for controlling HVAC equipment—i.e., McFarland discloses autonomous components consistent with Ollnova's accusations, which purport that a thermostat controller and/or associated remote temperature sensors are allegedly automation components that satisfy claim 20 of the '282 patent. Similarly, Liu discloses an autonomous system that incorporates power saving functionality in which sensor units detect environmental conditions which are evaluated prior to communicating data. In other words, in the event that Ollnova argues that the combination of McFarland and Liu which a POSITA would be motivated to make does not disclose the claimed autonomous components as construed by the Court, it should be noted that not only does this combination disclose automation components according to the Court's construction, but this combination satisfies Ollnova's own infringement theories, as far as these can be understood from its infringement contentions.

b. **20[a] scanning sensor data associated with each of a plurality of sensors contained within a multi-sensor package of a first automation component;**

695. McFarland discloses scanning sensor data associated with each of a plurality of sensors contained within a multi-sensor package of a first automation component for at least the following reasons.

696. As discussed in relation to the preamble of claim 1, McFarland discloses a wireless building control system comprised of multiple "sensor arrangements" networked together; where each sensor arrangement can wirelessly communicate to other wireless communication components (e.g., actuator arrangements and controllers) within the local subsystem; and where each such component constitutes an automation component of claim 1 of the '282 patent.

697. McFarland explains that the disclosed sensor arrangement is "configured to detect a plurality of variables, and generate sensor data for each variable," as required by claim element 1[a], where the sensor data is wirelessly communicated to and used by, for example, actuators to control building components. For example, McFarland states "[t]he sensor performs control processes appropriate for the sensor and regardless of the type of actuator being used, and the output from the sensor is wirelessly communicated to an actuator" (McFarland, [0006]). McFarland also states "[a]ctuators use the output sensor data to provide a response appropriate for the actuator. Controllers monitor the process or action of sensors and actuators without control in one mode of operation" (McFarland, [0027]). Additionally, McFarland also provides embodiments wherein "the higher level wireless network 12 and controllers 22 are operable to instruct redirection of data, such as sensor data from the sensor arrangement 16 to the higher level wireless network 12" (McFarland, [0060]).

698. McFarland also discloses that sensor modules can comprise multiple different sensors, each for sensing different variables, packed together into a sensor suite. More specifically, in reference

to sensor arrangement 16, McFarland discloses that "sensor 30 is a temperature sensor, humidity sensor, fire sensor, smoke sensor, occupancy sensor, air quality sensor, gas sensor, CO_2 or CO sensor or other now known or later developed sensors, such as an oxygen sensor for use in hospitals," where "[m]icro-electro-mechanical sensors or larger sensors for sensing any environmental condition may be used." (McFarland, [0035]). Notably, McFarland further states that "[i]n one embodiment, the sensor 30 includes a suit [*sic*] of sensors for sensing multiple environmental conditions" (*Id*., emphasis added).

699. At least because McFarland discloses a suite of sensors in a single device as recited, Ahmed discloses "a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detector variable." Consequently, for at least the reasons above, it is my opinion that McFarland discloses the requirements of claim element 20[a] of the '282 patent.

700. Further, for at least the reasons detailed in relation to Section VI.E.v.b, Ahmed satisfies this claim element; and, because McFarland incorporates Ahmed '849 by reference, which has the same or substantially the same disclosure as Ahmed, as discussed in section V.B, for at least the same reasons McFarland also satisfies claim element 20[a].

701. Ahmed '849 discloses scanning sensor data associated with each of a plurality of sensors contained within a multi-sensor package of a first automation component, for at least the following reasons.

702. As discussed in relation to the preamble of claim 20, Ahmed '849 discloses a wireless building control system comprised of multiple "space control subsystems" networked together; where each space control subsystem is comprised of a hub that can wirelessly communicate to other subsystems as well as sensor modules and actuator modules within the local subsystem; and where each hub and module constitute an automation component of claim 20 of the '282 patent.

703. Ahmed ’849 also discloses that sensor modules can comprise multiple different sensors, each for sensing different variables, packed together into a sensor suite. More specifically, in reference to MEMS sensor module 218 within an example sensor module, Ahmed ’849 discloses that “[t]he MEMS sensor device(s) 218 include at least one MEMS sensor, which may suitably by a temperature sensor, flow sensor, pressure sensor and/or gas-specific sensor. … In a preferred embodiment, several sensors are incorporated into a single device as a sensor suite 218” (Ahmed ’849, [0042], emphasis added).

704. Ahmed ’849 provides yet further details, disclosing that the several different sensors within a sensor suite may be fabricated onto a single semiconductor substrate. For instance, figure 12A (reproduced below), shows “a representative side view of a control system module according to an aspect of the invention” (Ahmed ’849, [0031]) that is an example “a single, self-powered, standalone device in which most of the active components are integrated onto one or two semiconductor substrates” (Ahmed ’849, [0102]-[0103]). Ahmed ’849 states “[t]he sensor suite 1252 is collection of MEMS sensors incorporated into a single substrate. The incorporation of multiple MEMS sensor technologies is known” (Ahmed ’849, [0107]). With respect to this design, Ahmed ’849 further explains that “the processing circuit 1256 performs the operations described above in connection with the signal processing circuit 216 and controller 212 of the sensor module 204 of FIG. 2” (Ahmed ’849, [0108]).

FIG. 12A

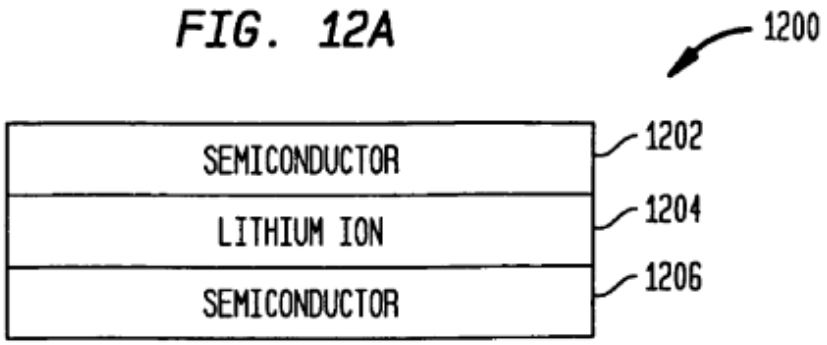


Figure 11 Reproduction of Ahmed ’849 figure 12A.

705. At least because Ahmed ’849 discloses a sensor suite, including incorporating several MEMS sensors on the same semiconductor substrate and packaging this within a single sensor module, Ahmed ’849 discloses “a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detector variable.” Indeed, a POSITA would recognize that integration of different sensors within a single substrate necessitates that these different sensors are packaged together, since otherwise the packaging would necessarily divide the semiconductor material into more than one substrate. Consequently, for at least the reasons above, it is my opinion that Ahmed ’849 discloses the requirements of claim element 20[a] of the ’282 patent.

706. In addition, Liu discloses multiple different kinds of sensor packaged within a single sensor unit, stating that “[i]f the sensor node 10, 50 includes multiple sensors, the control circuitry 35 may contain, for example, a multiplexer (as in the multiplexing control 62) to accept sensor signals from multiple sensors in a parallel or serial fashion” (*see* Liu, [0039], emphasis added). Thus, Liu discloses multiple different sensors within a single sensor unit, which a POSITA would understand satisfies the requirement for “a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable.”

707. Liu further discloses a wireless automation device, for example Liu describes an “apparatus compris[ing] one or more sensors for sensing conditions at the component or articles and producing one or more signals and a wireless transmitter for wirelessly transmitting data based on the one or more signals to a remote device” (Liu, Abstract). Liu additionally discloses “[t]he RF transceiver 36 [of the sensor apparatus], with the antenna 37, sends data to the hub 14 or other outer device, and may receive commands for controlling functions of the sensor node 10, 35. The antenna 37 may be, for example, an array of directional antennas and/or a multidirectional antenna”

(Liu, [0042]). The multi-directional, wireless sensor units of Liu which can receive and follow instructions constitutes automation components configured for wireless communication within a building automation system.

708. Liu also discloses a wireless automation device in which control circuitry (i.e., a processor) in is communication with the wireless communications component and the sensor package. More specifically, in a description of figure 4 of Liu, Liu states "components of a preferred sensor node 10 include: one or more sensors, for example digital and analog sensors 30, 32, for detecting environmental conditions around the structural component 12; an analog-to-digital converter 34 for converting signals from the analog sensors; control circuitry 35, for processing the signals from the sensors and producing a data stream, and may also decide what data if any will be transmitted, and/or take action based on commands from the hub 14 or the base 19, initiate a sleep mode, etc.; a radio-frequency (RF) transmitter 36 and an antenna 37, such as an antenna array for sending the data stream or receiving commands; timing circuitry 40, for timing the control circuit and/or the A-D converter; and a power source 42, for example with a voltage converter 44, providing power to the sensor node." (Liu, [0033], emphasis added). Therefore, it would be clear to a POSITA that the control circuitry 35 in a sensor unit of Liu would be in communication with a wireless communications component (i.e., RF transmitter 36 and corresponding antenna 37) and the sensors within the sensor suite (i.e., one or more sensors 30, 32), and that Liu consequently discloses the requirements of claim element 20[a].

709. These requirements would also be obvious to a POSITA in view of the specific combination of these references which a POSITA would be motivated to make. More specifically, as detailed in Section VI.G.i, a POSITA would be motivated to incorporate the energy saving approach of Liu—in which sensor units periodically acquire sensor readings but only transmit data

after evaluating whether it is necessary to do so—with the reconfigurable modules of McFarland, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the sensor modules of McFarland—which include multiple different MEMS sensors packaged within the same semiconductor substrate in Ahmed '849—are included within the combination of McFarland with Liu which a POSITA would be motivated to make, and therefore, for at least the reasons above, this combination satisfies the requirements of claim element 20[a].

710. Consequently, for at least the reasons above, it is my opinion that claim element 20[a] of the '282 patent is rendered obvious to a POSITA in view of McFarland in combination with Liu.

c. **20[b] identifying changed sensor values within the sensor data;**

711. The combination of McFarland and Liu discloses identifying changed sensor values within the sensor data, for at least the following reasons.

712. As shown, for example, in Figure 2 of McFarland, each sensor arrangement component includes a processor in communication with a sensor suite and a transmitter. McFarland further states that "[t]he sensor performs control processes appropriate for the sensor and regardless of the type of actuator being used, and the output from the sensor is wirelessly communicated to an actuator" (McFarland, [0006], emphasis added).

713. Similarly, in relation to figure 2 therein, McFarland states that "[t]he processor 32 is a general processor, digital signal processor, control processor, application specific integrated circuit, field programmable gate array, analog circuit, digital circuit, combinations thereof or other now known or later developed device for implementing a control process on a signal measured by the sensor 30," where "[t]he processor 32 has a processing power or capability and associated memory corresponding to the specific sensor 30 or corresponding to the needs of one of a plurality

of different types of sensors 30 with a maximum desired processing power, such as an 8 or 16 bit processor" (McFarland, [0036], emphasis added). McFarland further states that "[b]y minimizing the processor requirements and associated memory, the cost of the sensor arrangement 16 may be reduced," where "[t]he processor 32 implements a control process algorithm specific to the sensor arrangement 16" (*Id*., emphasis added).

714. McFarland further explains that "[f]or example, a control algorithm is distributed on both a sensor processor 32 and an actuator processor 38 for performing a single or multiple functions," where "[t]he portion of the control algorithm corresponding to a specific device 16, 18, 20 is then operated or implemented at the specific device without the need of further control" (McFarland, [0043]). In this regard, "[t]he control algorithm for the temperature function with in [*sic*] the room is distributed on the different sensor arrangement 16 and actuator arrangements 20," and "[t]he sensor arrangement 16 in this corresponding control algorithm outputs information specific to the sensing function without information indicating an act to be performed" (McFarland, [0043]).

715. A POSITA would recognize that the disclosed memory is utilized to store computer-readable instructions (e.g., the "control algorithm") for execution by the processor, as well as information utilized by the processor, at least because embedded memory is typically used in microprocessor systems for these purposes. In any event, McFarland expressly discloses that the memory of the sensor arrangement is in communication with the processor by explaining, at length, that this memory contains configuration information that is utilized by the processor, and the processor implements the disclosed functions of the disclosed system, including the processing of received information and the storage and transmission of sensor data.

716. Further, the storage of sensor data provided by the sensor package within the memory of the modules is inherent in the sensor modules, since these modules measure temperature and

convert the signals for transmission (see McFarland, [0068]), which a POSITA would understand requires storage of the sensor data, at least temporarily, within a cache or other memory within the sensor module. More specifically, a POSITA would recognize that the disclosed memory within a sensor module is a convenient memory in which to store sensor data after this has been derived from analog sensor data and before it has been transmitted by the communication system. Moreover, a POSITA would understand that such storage is required since there is no guarantee that a transmission will occur exactly when data is acquired and thus storage of the sensor data is necessary at least until it is transmitted. This is consistent with McFarland's disclosure, since a POSITA would recognize that the function of a sensor module necessarily involves obtaining sensor data and this data will necessarily need to be stored between acquisition and transmission. Therefore, a POSITA would recognize that storage of temperature values between their acquisition and subsequent transmission is required. Furthermore, the storage of sensor data within a sensor is a standard practice which would be expected by a POSITA as a normal feature in remote sensing devices required for their typical functionality.

717. Yet further, with respect to Ahmed '849 (incorporated by reference into McFarland), and as shown in figure 2 of Ahmed '849, each of the modules within a space control subsystem include a nonvolatile memory (labeled as "NV MEM") in the figure. Indeed, in reference to an example embodiment, Ahmed '849 discloses that "sensor module 204 includes a MEMS local RF communication circuit 210, a microcontroller 212, a programmable non-volitive [sic] memory 214, a signal processing circuit 216, and one or more MEMS sensors devices 218" (Ahmed '849, [0040], emphasis added). Ahmed '849 as discloses that programmable non-volatile memory 214 "may be embodied as a flash programmable EEPROM" (Ahmed '849, [0044]), and Figure 7a of

Ahmed ’849 clearly depicts this EEPROM memory as part of the module circuitry alongside a processing circuit and sensor suite.

718. A POSITA would recognize that the EEPROM is utilized to store programing for execution by the processor, as well as information utilized by the processor, at least because embedded EEPROM memory is typically used in microprocessor systems for these purposes. In any event, Ahmed ’849 expressly discloses that the non-volatile memory of the modules is in communication with the processor by explaining, at length, that this memory contains configuration information that is utilized by the processor and that the processor can write into the memory (i.e., the memory is necessarily in communication with the processor). For example, Ahmed ’849 discloses that “[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information” (Ahmed ’849, [0047]).

719. The storage of sensor data provided by the sensor package within the non-volatile memory of the modules is inherent in the sensor modules, since these modules convert the analog signals from embedded MEMS sensor devices into digital signals for RF transmission, which a POSITA would understand requires storage of the sensor data, at least temporarily, within a cache or other memory within the sensor module. More specifically, a POSITA would recognize that the flash EEPROM memory within a sensor module is a convenient memory in which to store sensor data after this has been derived from analog sensor data and before it has been transmitted by the RF communication system. Moreover, a POSITA would understand that such storage is required since there is no guarantee that a transmission will occur exactly when data is acquired and thus storage of the sensor data is necessary at least until it is transmitted. This is consistent with Ahmed ’849’s explicit disclosure that “[t]he EEPROM 1254 also stores information related to the function in

which the module 1200 will be used" (Ahmed '849, [0109]), since a POSITA would recognize that the function of a sensor module necessarily involves obtaining sensor data and this data will necessarily need to be stored between acquisition and transmission. Indeed, Ahmed '849 discloses that "the microcontroller 212 determines whether it is time to transmit an updated temperature value to the hub module 202 … [t]he determination of when to transmit temperature values may be driven by a clock internal to the sensor module 204, or in response to a request or query received from the hub mobile 202, or both" (Ahmed '849, [0085]). Therefore, a POSITA would recognize that storage of temperature values between their acquisition and subsequent transmission is required. Furthermore, the storage of sensor data within a sensor is a standard practice which would be expected by a POSITA as a normal feature in remote sensing devices required for their typical functionality.

720. In addition, Ahmed '849 discloses that the non-volatile memory of the modules therein stored "computer readable instructions which are executable by the processor." Indeed, in general, the invention claimed within Ahmed '849 contemplates space control subsystems utilizing multiple different sensor modules that "have the same physical construction" wherein different sensor modules contain different "configuration information" to determine which of the multiple sensors therein are used by a given sensor module and how each sensor module operates within the control subsystem (*see*, e.g., Ahmed, [0044]). More specifically, Ahmed discloses that "[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information" (Ahmed, [0039]). Furthermore, in relation to the describing how a sensor module may be configured to be a temperature sensor by programming the configuration information, Ahmed '849 discloses that "[t]he microcontroller

212, responsive to the configuration information, causes the signal processing circuit 216 to process signals only from the temperature sensor, ignoring output from other sensors of the sensor suite 218" (Ahmed, [0041]). Moreover, Ahmed '849 explicitly discloses that the configuration within the memory includes code required for the processor to utilize the applicable sensors for a specific purpose, stating "in one embodiment of the invention, most or all of the code unique to the selected function of the module is downloaded into the EEPROM 704 during configuration of the device … [t]hus, if the module 600 is to operate as a temperature sensor module, then all appropriate code for a temperature sensor module is downloaded to the EEPROM 704" (Ahmed '849, [0096]). Thus, the configuration information stored within the memory includes instructions that are executed by the processor to determine how to operate the sensor module.

721. As detailed above, McFarland discloses control information that may be wirelessly received by a sensor arrangement within a building automated control system to determine how the sensor arrangement functions. More broadly, McFarland contemplates a network of multiple wireless components (e.g., sensors and actuators), where each component contains similar hardware and may be configured to perform different functions using stored configuration information that determines, for example, which sensors are utilized and how the processor operates the module. More specifically, McFarland discloses that "[f]or example, a control algorithm is distributed on both a sensor processor 32 and an actuator processor 38 for performing a single or multiple functions," where "[t]he portion of the control algorithm corresponding to a specific device 16, 18, 20 is then operated or implemented at the specific device without the need of further control" (McFarland, [0043]). In this regard, "[t]he control algorithm for the temperature function with in [*sic*] the room is distributed on the different sensor arrangement 16 and actuator arrangements 20," and "[t]he sensor arrangement 16 in this corresponding control algorithm

outputs information specific to the sensing function without information indicating an act to be performed" (McFarland, [0043]). Thus, McFarland explicitly discloses automation components within a building automation system in which each component may be configured, using configuration information received by the component, to perform a given subset of its possible functions and to perform in various roles required by the building automation system.

722. Furthermore, Ahmed '849, whose disclosure is expressly incorporated into McFarland, discloses "configuration information" that may be wirelessly received by a module within a space control subsystem to determine how the module functions. More broadly, Ahmed '849 contemplates a network of multiple modules, where each module is the same but may be configured to perform different functions using stored configuration information that determines, for example, which sensors are utilized and how the processor operates the module. More specifically, Ahmed '849 discloses that each module therein "may readily be configured as any one of a large plurality of sensor types or even other types of building automation system components … reducing the per-unit tooling and design costs associated with ordinary building automation sensors … [i]t will be noted that the design of module 600 may not only be used as the sensor modules 204, 206 in exemplary space control subsystem 200 of FIG. 2, but may also be used as the hub module 202" (Ahmed '849, [0113]). Thus, Ahmed '849 explicitly discloses automation components within a building automation system in which each component may be configured, using configuration information received by the component, to perform a given subset of its possible functions and to perform in various roles required by the building automation system

723. As previously also discussed, the sensor arrangement disclosed in McFarland discloses what a POSITA would recognize as a memory in communication with the processor that can be used for the storage of sensor data collected by this disclosed sensors. McFarland also discloses

that its design is intended to achieve energy savings, including with respect to performing tasks only when necessary (*see*, e.g., McFarland, [0009], [0086], [0191]). Further, the module within a space control subsystem of Ahmed '849 discloses what a POSITA would recognize as a memory in communication with the microcontroller that can be used for the storage of sensor data, at least temporarily in flash memory, collected by the one or more MEMS sensors devices. A POSITA would be motivated to incorporate the energy saving approach of Liu into the control information of McFarland, and the configuration information of Ahmed—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. By introducing the power saving aspects of Liu into the BAS disclosed in McFarland and Ahmed '849, specifically that in which sensor readings are evaluated against sensor value threshold criteria upon waking up from a sleep, or otherwise transitioning from a periodic low power mode, it becomes obvious to a POSITA to identify sensor values at regular intervals and evaluate them against previously collected readings to determine anomalous conditions or changes of value during the sleep interval. Indeed, McFarland itself recognizes energy savings that can be gained by intermittently energizing circuitry as needed (see McFarland, [0086]). More generally, it would be straightforward to a POSITA that one possible method of evaluating sensor value data to make a determination of whether or not to transmit the data to an external unit would be to compare the sensor reading against, for example, sensor value threshold criteria, which could be easily programmed into the sensor modules. In other words, generally, the approach of Liu involves the sensor unit determining whether or not to transmit sensor data based on some condition, for example threshold criteria, to increase battery life by limiting transmission of data; and, it would be obvious to a

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POSITA that the sensor modules of McFarland could similarly benefit in the same way by incorporating the same kind of determination of whether or not to transmit sensor data at least because the sensor modules of McFarland contain the required processing capabilities and would benefit in the same way as the sensor units of Liu from reduced energy use.

724. In more detail, Liu discloses that in order to conserve power, if a "sleep mode is entered 94, and the sensor node 10, 50 waits for a signal to wake, which may be at a particular time, after a particular time interval, or upon receipt of an outside signal," and that "[o]nce awakened, the sensor node 10, 50 receives (step 70) a new signal input from the sensor 30, 32" (Liu, [0049]), which would then be processed and evaluated by the control circuitry 35 to determine whether to not to transmit the data to another unit. Broadly, this power saving functionality demonstrates that the teachings of Liu allows for automation components comprising sensors to elongate battery life by only checking the values of sensors at regularly defined intervals, which occur at "a particular time" or "after a particular time interval."

725. Liu explicitly states that "[t]he health and status of civil structures, for example, may be monitored using sensor nodes for scheduling routine maintenance or to assist in emergencies" (Liu, [0024]). It would be well known to a POSITA that a common and safety-critical application for the detection of environmental conditions would be for the notification of an adverse condition during emergencies (e.g., fire, earthquake, etc.). As such, it would be clear and desirable for a POSITA to include instructions within the programmable control circuit 35 that would evaluate the environmental condition sensor readings against threshold criteria that would indicate whether such a threshold has been exceeded in order to determine if the data should be transmitted to external units. In other words, in order for the detection of an anomalous environment condition to be communicated from the sensor unit, such an anomaly must be detected, which would require

the identification of sensor values when it takes readings, and an evaluation of those readings against a set of criteria that would determine if the reading was, in fact, anomalous.

726. More specifically, it would be known to a POSITA that there is a finite number of threshold choices available for such an application: (1) a high threshold (i.e., exceed a high threshold); (2) a low threshold (i.e., subceed a low threshold); (3) within a range of values (i.e., outside an inner range threshold); (4) not within a range of values (i.e., inside an outer range threshold); and (5) a combination of the previous options. Moreover, a POSITA would understand that the threshold choice above could be applied to *absolute* values (i.e., fixed, predetermined thresholds) or to *relative* values (i.e., thresholds that depend on the previous or current measured values). Indeed, it is obvious to a POSITA that one criterion that grants the benefits of Liu (i.e., reduced transmission energy usage by selective determination of when to transmit data) could be implemented using a relative application of choice (4) such that data is only transmitted when a meaningful change is detected. This would, for example, increase the battery life of a temperature sensor by preventing repeated transmission of the same temperature when a room's temperature is stable; because an HVAC system only needs to act when temperature changes, there is no need for a constant temperature to be repeatedly transmitted and thus the system of Liu achieves its goal of reducing transmission of data without effecting how the HVAC system operates.

727. In more detail, to effectively determine when a sensor reading has changed from that of a previous reading, it would be obvious to a POSITA that a small inner range threshold would be used. For example, if a temperature has a set point of a certain value, an inner range threshold criteria could be plus or minus one degree. Thus, if a temperature reading within a space control subsystem is taken that falls outside of this narrow range, then the system would detect a change-of-value from the set point, and the condition would be reported to the base unit or a second

automation component to maintain the system to operate as intended. As such, a POSITA would be motivated to implement an inner rage threshold as a change-of-value threshold into the BAS of McFarland (and Ahmed ’849). In other words, using the inner range threshold criteria within the BAS of McFarland (and Ahmed ’849) could be used to make the determination to send an alert if a measurement is outside a predefined range, which would be obvious to a POSITA interested in maintaining a system at particular sensor reading values while checking readings periodically, in view of Liu’s emphasis on energy efficiency.

728. Thus, by programming the power saving functionality of Liu into the configuration information of the reconfigurable modules of McFarland, a POSITA could easily program an inner range threshold by which sensor values could be detected as different from previous values of the same sensor (i.e., identify changed sensor values within the sensor data). Consequently, for at least the reasons above, it is my opinion that McFarland in view of Liu discloses the requirements of claim element 20[b] of the ’282 patent.

d. **20[c] receiving a first communication from a second automation component in communication with the first automation component and the building automation system; and**

729. McFarland discloses that in a second mode of operation, one or more sensor arrangements may receive control information from a second automation component in communication with the building automation system, such as a controller.

730. For example, in relation to figure 2 therein, McFarland states that “[t]he processor 32 has a processing power or capability and associated memory corresponding to the specific sensor 30 or corresponding to the needs of one of a plurality of different types of sensors 30 with a maximum desired processing power, such as an 8 or 16 bit processor” (McFarland, [0036], emphasis added). McFarland further states that “[b]y minimizing the processor requirements and associated

memory, the cost of the sensor arrangement 16 may be reduced," where "[t]he processor 32 implements a control process algorithm specific to the sensor arrangement 16" (*Id*., emphasis added).

731. McFarland further explains that "[f]or example, a control algorithm is distributed on both a sensor processor 32 and an actuator processor 38 for performing a single or multiple functions," where "[t]he portion of the control algorithm corresponding to a specific device 16, 18, 20 is then operated or implemented at the specific device without the need of further control." (McFarland, [0043]). In this regard, "[t]he control algorithm for the temperature function with in [*sic*] the room is distributed on the different sensor arrangement 16 and actuator arrangements 20," and "[t]he sensor arrangement 16 in this corresponding control algorithm outputs information specific to the sensing function without information indicating an act to be performed." (McFarland, [0043]).

732. McFarland additionally discloses that "[i]n another mode of operation, the controllers override the sensor and/or actuators to alter processing based on a regional or larger area control process" (McFarland, [0027]; see also Abstract; [0006]; [0050]). The disclosed regional control or "override" by the controllers includes, for example, transmission of operation control instructions, instructions to direct certain sensor data, and communication settings, that are received by the sensor arrangements.

733. For example, McFarland states that transceiver 44 of controller 22 "is operable to send and/or receive information to and/or from any of the sensor arrangements 18, actuator arrangements 20, or other devices 18," where "[i]nformation from various ones of the devices 16, 18 and 20 may be received at the same or different times by the transceiver 44 for aggregate processing and routing by the processor 42" (McFarland, [0053]). McFarland further states that "[t]he transceiver 44 is also operable to transmit information to multiple or specific ones

of the devices 16, 18, 20," where such information includes "[f]or example, binding associations, control instructions, communications settings or other information" (*Id*., *see* also McFarland, [0061]-[0062]).

734. McFarland further explains that "[i]n overriding local control, the higher level wireless network 12 and controllers 22 are operable to instruct redirection of data, such as sensor data from the sensor arrangement 16 to the higher level wireless network 12" (McFarland, [0060]). McFarland additionally states that, "[a]s another alternative, the sensor and/or actuator arrangements 16, 20 request control input from one or more controllers 22" (*Id*.). As one example, an actuator may forward sensor data received from one or more sensor arrangements to a controller (alone or in the aggregate), whereafter "[t]he controller 22 outputs control instructions for the actuator arrangement 20 or another device or uses the transmitted information without further control output," and the actuator or other devices then performs tasks consistent with the control instructions received from the controller (*Id*., *see* also McFarland, [0061]).

735. With respect to use and redirection of sensor data, McFarland explicitly states that a controller transceiver "is operable to send and/or receive information to and/or from any of the sensor arrangements 18, actuator arrangements 20, or other devices 18," and that the transceiver "is also operable to transmit information to multiple or specific ones of the devices 16, 18, 20." (McFarland, [0053], emphasis added). McFarland further states that controllers may instruct one or more sensor arrangements to perform functions (e.g., adjust set point temperatures), and "[a]ny use of data from multiple sensors and/or actuators, such as data from multiple rooms or other aggregates of data outside of or different than the bindings established for the lower level wireless network 14, are performed by one or more controllers 22" (McFarland, [0062]).

736. Taken together, a POSITA would have understood McFarland's disclosure to describe one or more automation components (e.g., sensor arrangements 16) that may receive control information from a second automation component (e.g., controller 22) in communication with the building automation system, where such information may be an identification of sensor or sensor values driving or controlling the second automation component (e.g., control information identifying of particular sensors or sensor data required by the controller, and that requires redirection to the controller for use by the controller and/or other components within the higher level wireless network). Accordingly, the sensor arrangements of McFarland perform a step of "receiving a first communication from a second automation component in communication with the first automation component and the building automation system," and it is my opinion that McFarland discloses the requirements of claim element 20[c] of the '282 patent.

737. As detailed above with respect to claim element 20[b], Ahmed '849 discloses "configuration information" that may be wirelessly received by a module within a space control subsystem to determine how the module functions. As also detailed in relation to claim element 20[b], Ahmed '849 contemplates a network of multiple modules, where each module is the same but may be configured to perform different functions using stored configuration information that determines, for example, which sensors are utilized and how the processor operates the module. More specifically, Ahmed '849 discloses that each module therein "may readily be configured as any one of a large plurality of sensor types or even other types of building automation system components … reducing the per-unit tooling and design costs associated with ordinary building automation sensors … [i]t will be noted that the design of module 1200 may not only be used as the sensor modules 204, 206 in exemplary space control subsystem 200 of FIG. 2, but may also be used as the hub module 202" (Ahmed '849, [0113]). Thus, Ahmed '849 explicitly discloses

automation components within a building automation system in which each component may be configured, using configuration information received by the component, to perform a given subset of its possible functions and to perform in various roles required by the building automation system.

738. More generally, in reference to a module, Ahmed ’849 discloses that “[t]he microcontroller 212 is further operable to receive configuration information via the RF communication circuit 210, store configuration information in the memory 214, and perform operations in accordance with such configuration information” (Ahmed ’849, [0047])—i.e., Ahmed ’849 discloses that an automation component “receives” configuration information via its wireless communication device and that this received configuration information is stored in the memory and utilized by the processor to determine how to operate the automation component.

739. Furthermore, the configuration information identifies “sensor or sensor value is driving or controlling a second automation component.” More specifically, Ahmed ’849 discloses that the configuration information determines which sensor(s) are required for an automation component’s function, e.g., in relation to configuring a sensor module to operate as a temperature sensor as part of an HVAC system Ahmed ’849 discloses “the EEPROM 704 may store information identifying that module 600 should enable its temperature sensing function as opposed to any of its other possible sensing functions” (Ahmed ’849, [0109]).

740. In particular, Ahmed ’849 discloses that the microprocessor within a sensor module uses the configuration information “to cause the appropriate sensor device or devices from the sensor device suite 218 to be operable connected to the signal processing circuit such that sensed signals from the appropriate sensor device are digitized and provided to the microcontroller 212 … the microcontroller 212 may also use the configuration information to format outgoing messages

and/or control operation of the RF communication circuit 210" (Ahmed '849, [0047]). Moreover, in relation to the example embodiment where the sensor module is part of a HVAC control system, Ahmed '849 discloses that "[t]he microcontroller 212, responsive to the configuration information, causes the signal processing circuit 216 to process signals only from the temperature sensor, ignoring output from other sensors of the sensor suite 218" (Ahmed '849, [0049]). Thus, Ahmed '849 explicitly discloses that the configuration information, which is received by a module via the module's RF communication device, identifies the sensor or sensor values that the module should process and transmit.

741. Furthermore, Ahmed '849 describes that the example space control system of Fig. 2 comprises an HVAC system in which "sensor module 204 is configured to enable its temperature sensing function" (Ahmed, [0042]), "sensor module 206 is configured to operate as a flow sensor" (Ahmed, [0052]), "actuator module 208 … is operable to control the position of a ventilation damper, thereby controlling the flow of heated or chilled air into the room" (Ahmed '849, [0053]), and "hub module 202 … performs the function of the loop controller (e.g., a PID controller) for the space control subsystem 110" (Ahmed '849, [0059]). Thus, Ahmed '849 discloses an example embodiment of a space control system where a temperature sensor, flow sensor, and damper actuator are coordinated via a controller to perform HVAC operations.

742. Accordingly, a POSITA would understand that the temperature sensor provides the inside temperature to the hub, which then determine whether or not adjustments to the actuator are required to enforce programmed temperature settings. Indeed, Ahmed '849 states that hub module 202 "obtains process variable values (i.e., sensor information) from either or both of the sensor modules 204 and 206 and generates control output values," "provides the control output values to the actuator module 208," and also "communicates with external elements of the building control

system, for example the supervisory computer, fan or chiller control subsystems, and other room controller subsystems" (Ahmed '849, [0059], *see* also Ahmed '849, [0069]).

743. Therefore, at least because Ahmed '849 explicitly contemplates the use of multiple similar modules which are configured to perform a particular role by configuration information programmed into each module memory, and because the sensor modules are connected to the supervisory computer via the hub modules, each sensor module receives configuration information from a hub module to cause it to function as required by the hub. More specifically, when configuring a space control subsystem of Ahmed '849 for its purpose, the appropriate configuration information must be transmitted to each sensor module from the hub. Indeed, a POSITA would understand configuration could be achieved via the supervisory computer—which facilitates network management and coordination of communication of data and control signals (Ahmed '849, [0082]). Thus, Ahmed '849 discloses that a module configuration, which a POSITA would understand involves, for example, a controller requisitioning required sensor modules for its assigned control processes via distributing corresponding configuration information.

744. Consequently, for at least the reasons above, the configuration information of Ahmed '849 is received by sensor modules within space control subsystems from hub modules within the same building control system, and this configuration information is used by the sensor modules to identify which sensor values are required to be transmitted to the hub module. Accordingly, the modules of Ahmed '849 perform a step of "receiving a first communication from a second automation component in communication with the first automation component and the building automation system," and it is my opinion that Ahmed '849 discloses the requirements of claim element 20[c] of the '282 patent.

745. In addition to McFarland (and Ahmed ’849 incorporated therein) individually disclosing the requirements of claim element 20[c] of the ’282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of McFarland with Liu which a POSITA would be motivated to make. More specifically, as detailed in Section VI.G.i, a POSITA would be motivated to incorporate the energy saving approach of Liu—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of McFarland, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the combination of McFarland with Kates which a POSITA would be motivated to make includes the reconfigurable modules of McFarland which utilize control/configuration information in a way that satisfies the limitations of claim element 20[c], and therefore, for at least the reasons above, this combination satisfies the requirements of claim element 20[c].

e. **20[d] communicating a portion of the identified changed sensor values associated with the first communication received from the second automation component.**

746. For at least the reasons detailed in relation to claim element 20[c], a sensor arrangement of McFarland (i.e., an example “automation component”) communicates a portion of its stored data corresponding to the received sensor control information from a controller (i.e., an example “second automation component”) within the same building automation system. More specifically, as detailed in relation to previous claim elements of claim 20, each sensor arrangement within a building automation system of McFarland receives control information, which may be wirelessly transmitted to each sensor arrangement from one or more controllers; this configuration information is used by each sensor module to identify which sensor or sensor data is needed by

the controller (or other high level network components) for control processes, and the corresponding sensor data is transmitted.

747. Consequently, for at least the reasons above, it is my opinion that McFarland discloses the requirements of claim element 20[d] of the ’282 patent.

748. Furthermore, for at least the reasons detailed in relation to Section VI.E.v.d, Ahmed satisfies this claim element; and, because McFarland incorporates Ahmed ’849 by reference, which has the same or substantially the same disclosure as Ahmed, as discussed in Section V.B, for at least the same reasons McFarland also satisfies claim element 20[d].

749. For at least the reasons detailed in relation to claim element 20[d], a sensor module of Ahmed ’849 (i.e., an example “automation component”) communicates a portion of its stored data corresponding to the received sensor control information from a controller hub (i.e., an example “second automation component”) within the same building automation system. More specifically, as detailed in relation to previous claim elements of claim 20, each sensor module within a space control subsystem of the building automation system of Ahmed ’849 receives “configuration information,” which may be wirelessly transmitted to each sensor module from a controller hub; this configuration information is used by each sensor module to identify which of several different kinds of available sensor data is needed by the hub for the hub’s control processes, and the corresponding sensor data is transmitted to the controller hub.

750. Consequently, for at least the reasons above, it is my opinion that Ahmed ’849 discloses the requirements of claim element 20[d] of the ’282 patent.

751. In addition to McFarland (and Ahmed ’849 incorporated therein) individually disclosing the requirements of claim element 20[d] of the ’282 patent, these requirements would also be obvious to a POSITA in view of the specific combination of McFarland with Liu which a POSITA

would be motivated to make. More specifically, as detailed in Section VI.G.i, a POSITA would be motivated to incorporate the energy saving approach of Liu—in which sensor units periodically acquire sensor readings but only transmit data after evaluating whether it is necessary to do so—with the reconfigurable modules of McFarland, in order to increase the battery lifetime of these modules and reduce maintenance costs for building automation systems implemented with these modules. Thus, the combination of McFarland with Liu which a POSITA would be motivated to make includes the reconfigurable modules of McFarland which utilize control or configuration information to identify which sensor values should be communicated as required by claim element 20[d], and therefore, for at least the reasons above, this combination satisfies the requirements of claim element 20[d].

vi.Claim 21

752. Claim 21 of the ’282 Patent recites:

> The method of claim 20, wherein identifying changed sensor values includes identifying changed sensor values as a function of a change-of-value threshold.

753. Claim 21 of the ’282 depends upon claim 20 therein, and includes additional limitations pertaining to the identification of sensor values that exceeds a change-of-value threshold. For at least the reasons detailed above in relation to claim 20, it is my opinion that the combination of McFarland with Liu discloses each and every limitation of claim 20 of the ’282 patent; and, for at least the reasons below, it is my opinion that the combination of McFarland and Liu also renders obvious the limitations added to this claim by claim 21.

754. As previously discussed for claim element 20[b], the combination of McFarland and Liu makes it obvious to a POSITA that in order for an anomalous environmental condition detection to be communicated from the sensor unit 102, such a condition must be detected (e.g., a fire

emergency), which would require the identification of sensor values when it takes readings, and an evaluation of those readings against a set of criteria that would determine if the reading was, in fact, anomalous.

755. Liu explicitly states that "[t]he health and status of civil structures, for example, may be monitored using sensor nodes for scheduling routine maintenance or to assist in emergencies" (Liu, [0024]). It would be well known to a POSITA that a common and safety-critical application for the detection of environmental conditions would be for the notification of an adverse condition during emergencies (e.g., fire, earthquake, etc.). As such, it would be clear and desirable for a POSITA to include instructions within the programmable control circuit 35 that would evaluate the environmental condition sensor readings against threshold criteria that would indicate whether such a threshold has been exceeded in order to determine if the data should be transmitted to external units. In other words, in order for the detection of an anomalous environment condition to be communicated from the sensor unit, such an anomaly must be detected, which would require the identification of sensor values when it takes readings, and an evaluation of those readings against a set of criteria that would determine if the reading was, in fact, anomalous.

756. More specifically, it would be known to a POSITA that there is a finite number of threshold choices available for such an application: (1) a high threshold (i.e., exceed a high threshold); (2) a low threshold (i.e., subceed a low threshold); (3) within a range of values (i.e., outside an inner range threshold); (4) not within a range of values (i.e., inside an outer range threshold); and (5) a combination of the previous options. Moreover, a POSITA would understand that the threshold choice above could be applied to *absolute* values (i.e., fixed, predetermined thresholds) or to *relative* values (i.e., thresholds that depend on the previous or current measured values). Indeed, it is obvious to a POSITA that one criterion that grants the benefits of Liu—i.e., reduced transmission

energy usage by selective determination of when to transmit data—could be implemented using a relative application of choice (4) such that data is only transmitted when a meaningful change is detected. This would, for example, increase the battery life of a temperature sensor by preventing repeated transmission of the same temperature when a room's temperature is stable; because an HVAC system only needs to act when temperature changes, there is no need for a constant temperature to be repeatedly transmitted and thus the system of Liu achieves its goal of reducing transmission of data without effecting how the HVAC system operates.

757. In more detail, to effectively determine when a sensor reading has changed from that of a previous reading, it would be obvious to a POSITA that a small inner range threshold would be used. For example, if a temperature has a set point of a certain value, an inner range threshold criteria could be plus or minus one degree. Thus, if a temperature reading within a space control subsystem is taken that falls outside of this narrow range, then the system would detect a change-of-value from the set point, and the condition would be reported to the base unit or a second automation component to maintain the system to operate as intended. As such, a POSITA would be motivated to implement an inner rage threshold as a change-of-value threshold into the BAS of McFarland (and Ahmed '849). In other words, using the inner range threshold criteria within the BAS of McFarland (and Ahmed '849) could be used to make the determination to send an alert if a measurement is outside a predefined range, which would be obvious to a POSITA interested in maintaining a system at particular sensor reading values while checking readings periodically, in view of Liu's emphasis on energy efficiency.

758. Furthermore, as discussed for claim element 20[b], McFarland discloses that "controllers override the sensor and/or actuators to alter processing based on a regional or larger area control process" (McFarland, [0027]; *see* also McFarland, Abstract, [0006], [0050]). The disclosed

regional control or "override" by the controllers includes, for example, transmission of operation control instructions, instructions to direct certain sensor data, and communication settings, that are received by the sensor arrangements. Similarly, Ahmed '849 discloses that "sensor module 204 includes a MEMS local RF communication circuit 210, a microcontroller 212, a programmable non-volitive [*sic*] memory 214, a signal processing circuit 216, and one or more MEMS sensors devices 218" (Ahmed '849, [0040], emphasis added). As such, it would be obvious to a POSITA to program a change-of-value threshold into the control information of McFarland, or the "configuration information" of Ahmed '849, to allow the sensor module to identify changes in sensor values.

759. Thus, by programming the power saving functionality of Liu into the configuration information of the reconfigurable modules of McFarland, a POSITA could easily program an inner range threshold by which sensor values could be detected as different from previous values of the same sensor; and, the sensor module would then be able to identify changes to sensor values as a function of a change-of-value threshold. Consequently, for at least the reasons above, it is my opinion that McFarland in view of Liu discloses the requirements of claim 21 of the '282 patent.

VII. INVALIDITY OF US PATENT NO. 7,746,887 ("the '887 Patent")

A. Summary of the '887 Patent

760. The '887 patent, titled "Dynamic value reporting for wireless automated systems," was filed on April 12, 2006, was published on June 29, 2010, and claims a priority date of April 12, 2006.

761. It is directed to "remote monitoring of conditions and more particularly to wirelessly reporting a sensed condition over a wireless communication network" ('887 patent, 1:6-8). More specifically, the '887 patent purports to address efficiency in wireless networks of automation

components, stating that "there is a need for a system for reducing an amount of communication over a wireless automation system using dynamic value reporting" ('887 patent, 1:47-49).

762. To achieve its purported goal of improving wireless networks, the '887 patent purports to disclose "methods, processes, apparatus, and systems for reporting information over a wireless automation system" and states that:

> An automated wireless system using dynamic value reporting provides for a robust process control that minimizes an amount of communications in the wireless network. The amount of wireless traffic in the system may be reduced, and/or the number of devices communicating over the network increased, by minimizing or reducing the amount of information reported by a sensor ('887 patent, 1:56-62).

763. Thus, generally, the '887 patent describes making determination of whether a measurement for a condition has changed in a significant way and transmitting information only when this is the case (*see,* e.g., '887 patent 1:63-2:34).

764. The specification of the '887 patent details how a device such as the one shown in Fig. 2 of the '887 patent (reproduced below) comprises an "automation device 207 for a wireless automation system using dynamic value reporting" ('887 patent, 6:58-60). In this figure, the device is being shown including at least "a processor 214, a transceiver 216, and a sensor 209" ('887 patent, 7:27-28). Other components that may be provided also include "a memory 226" and a "storage device 228" ('887 patent, 7:28-32).

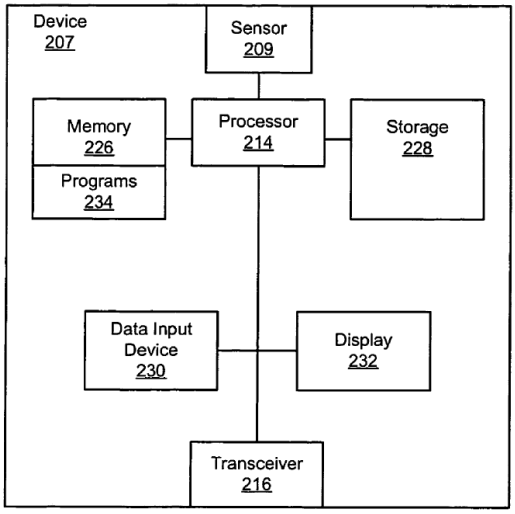


Figure 2 of the ’887 Patent.

765. The specification continues that the sensor 209 “sense[s]condition, parameters and/or events such as an environmental condition in a building” (’887 patent, 8:46-48). The sensor then “generates information or data related to the sensed or monitored condition” and “provide[s] an output” that “may be read by the processor 214” (’887 patent, 8:48-51).

766. The “processor 214 implements a control process for the device 207” which “may be implemented based on a signal that is read from and/or provided by the sensor 209, such as a measured value of a parameter, an indicator of a sensed condition and/or status of an event” (’887 patent, 7:48-52). Further, the processor 214 “may also interface the storage device 228 for storage and retrieval of data” and that data may be “communicated via the transceiver 216, and/or presented via data output device 232” (’887 patent, 8:5-9).

767. The transceiver 216 “wirelessly communicates information” via various communication protocols (’887 patent, 8:24-46).

768. As an example of a change of value process performed by the device, Figure 3 of the ’887 patent (reproduced below) “illustrates a timing chart illustrating the polling interval for a sensor configured for dynamic value reporting” and Figure 4 of the ’887 patent (reproduced below)

"illustrates a timing chart for the transmission of information for a device configured for dynamic value reporting" (the '887 patent, 2:44-50); in discussion of these figures, the '887 patent describes that polling of sensor values and transmission of corresponding readings may both occur periodically with timescales governed by polling and transmission intervals, respectively, but that broadcast may only occur during some transmission intervals when predetermined conditions, such as the detection of an appreciable change in the sensed value, are satisfied (*see, e.g.,*'887 patent, 9:17-11:16).

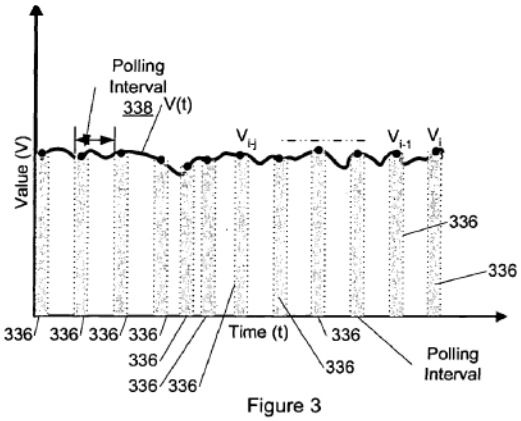


Figure 3

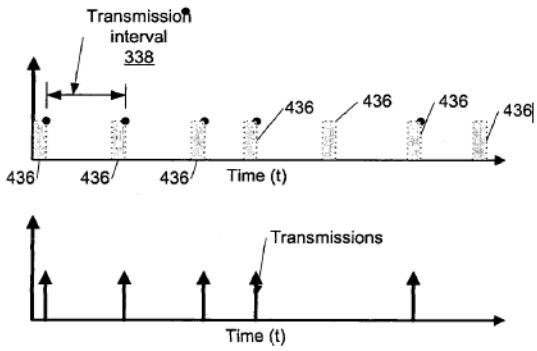


Figure 4

Figures 3 and 4 of the '887 Patent.

769. During prosecution of the application that issued as the '887 patent (U.S. Patent Application No. 11/402,743), the examiner found the original claims as presented invalid in view of U.S. Patent Publication No. 2003/0174070 ("Garrod") (*see* June 8, 2009, Non-Final Office

Action). In response, the applicant, among other things, amended the claim 1 to include "a memory, the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval" (*see* December 12, 2011, Response to Non-Final Office Action). The applicant further argued that Garrod did not disclose storing at least one prior reading of an indicator in the wireless automation device (*Id*.). Following this, the examiner maintained the rejection of the claims in view of Garrod, and further objected to claims 7-10 as being dependent upon a rejected base claim, but otherwise allowable if written in independent form (*see* November 13, 2009, Final Office Action). In response, the applicant amended claim 1 to include limitations from dependent claims, and then canceled those dependent claims. Specifically, the applicant amended claim 1 to include the limitation "wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a change in the sensed condition within the predetermined range" (*see* January 27, 2010, Response to Final Office Action). In response to this amendment, on February 22, 2010, the examiner issued a Notice of Allowability and allowed the claims to issue.

770. As demonstrated below, the claim features added by applicant during prosecution were well known at the time, including in view of at least Kates, Helgeson, and Lareau. Kates, Helgeson, and Lareau were not before the examiner during prosecution of the application that issued as the '887 patent.

771. I understand that on March 6, 2023, Emerson filed a petition for *inter partes* review with the USPTO seeking to invalidate certain claims of the ’887 patent, including some of the asserted claims (IPR2023-00626, Petition). In the petition, Emerson asserted that one or more claims are anticipated or obvious over, among other art, U.S. Patent No. 7,102,505, which is the patent that issued from the application published as Kates. I understand that, as of the date of this report, Ollnova has not responded to the petition, and the USPTO has not issued an institution decision. I reserve the right to provide further opinions concerning this proceeding as further events occur.

B. Claim Construction for the ’887 Patent

772. I understand that the following terms found in the ’887 patent assert claims have been construed by the Court or have a construction that was agreed upon by the parties.

Claim Term	Construction
“wherein transmission of the most recent reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a change in the sensed condition within the predetermined range” (’887 patent, claim 1)	“wherein the transmission of the most recent reading of the indicator that would otherwise occur is stopped for the remainder of the transmission interval in response to detecting a change in the sensed condition within the predetermined range”
“information associated reading of the indicator” (’887 patent, claims 1, 21)	“information associated with the reading of the indicator”
“chance” (’887 patent, claim 1)	“change”

773.

C. Claims 1, 11, 12, 20, and 21 of the ’887 patent are anticipated or obvious to a POSITA in view of Kates

i. Claim 1

774. Claim 1 of the ’887 patent recites:

> A wireless automation device, comprising:

> a transceiver operable to wirelessly communicate packets of information over a wireless network;
>
> a sensor operable to generate a [*sic*] indicator for a sensed condition;
>
> a controller configured to poll the sensor at a polling interval to read the indicator during a current period of the polling interval and to selectively operate the transceiver to communicate information associated reading of the indicator; and
>
> a memory, the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval,
>
> wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a chance in the sensed condition within the predetermined range.

775. Thus, claim 1 of the ’887 patent is directed towards a wireless automation device, and includes limitations pertaining to the content and timing of bi-directional communication between a remote device and a base unit. For at least the reasons detailed below, each and every limitation of claim 1 of the ’887 patent is disclosed by Kates, and consequently, this claim is invalid as anticipated or obvious to a POSITA in view of Kates.

a. **1[pre] A wireless automation device, comprising:**

776. To the extent that the preamble of claim 1 of the ’887 Patent is limiting, Kates discloses a wireless automation device for at least the following reasons.

777. Kates discloses a wireless automation device, for example Kates describes “[a] low cost, robust, wireless sensor system that provides an extended period of operability without maintenance” (Kates, Abstract). Kates additionally discloses “[i]n one embodiment, the sensor

unit is bi-directional and configured to receive instructions from the central reporting station (or repeater). Thus, for example, the central reporting station can instruct the sensor to: perform additional measurements, go to a standby mode, wake up; report battery status, change wake-up interval, run self-diagnostics and report results, etc." (Kates, [0008]). Kates discloses wireless sensor units that are designed to operate within the disclosed automation system (Kates, [0036], [0052], Figure 2).

778. Thus, for at least the reasons detailed above, Kates discloses a wireless automation device as required by the preamble to claim 1 of the '887 patent.

b. **1[a] a transceiver operable to wirelessly communicate packets of information over a wireless network;**

779. Kates discloses a transceiver operable to wirelessly communicate packets of information over a wireless network, as required by claim element 1[a], for at least the following reasons.

780. As can be seen in Figure 2 of Kates, reproduced here as Figure 45, the sensor unit 102 contains a transceiver 203 operatively connected to the controller 202. The transceiver 203 transmits wireless communications, and as disclosed by Kates "[t]he sensor unit 102 attaches its ID to outgoing communication packets so that transmissions from the sensor unit 102 can be identified by the repeater 110" (Kates, [0036]).

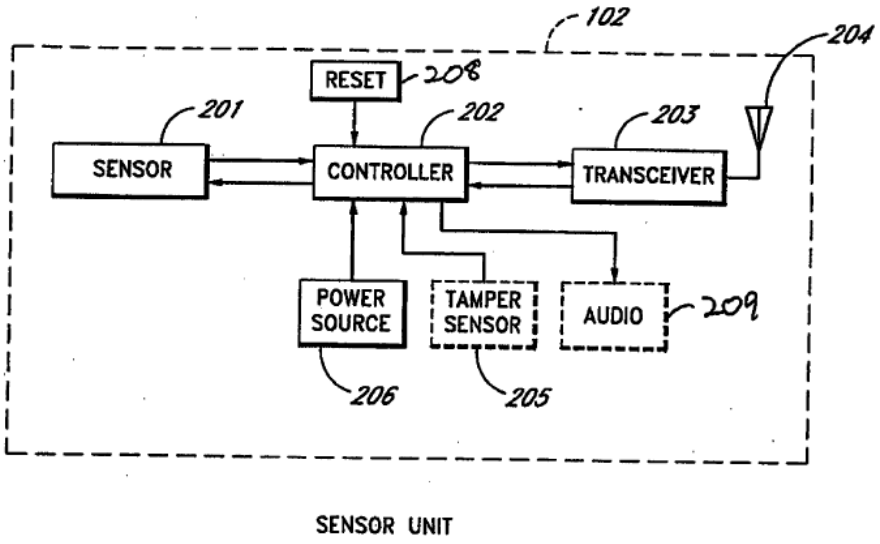


FIG.2

Reproduction of Figure. 2 of Kates showing a block diagram for a sensor unit

781. Thus, for at least the reasons detailed above, Kates discloses a transceiver operable to wirelessly communicate packets of information over a wireless network as required by claim element 1[a] of the '887 Patent.

c. **1[b] a sensor operable to generate a indicator for a sensed condition;**

782. Kates discloses a sensor operable to generate an indicator for a sensed condition, as required by claim element 1[b], for at least the following reasons.

783. Kates discloses a sensor system which "includes a battery-operated sensor unit that detects a condition, such as, for example, smoke, temperature, humidity, moisture, water, water temperature, carbon monoxide, natural gas, propane gas, other flammable gases, radon, poison gasses, etc." and that "[i]f an anomalous condition is detected, then the sensor unit 'wakes up' and begins communicating with the base unit or with a repeater" (Kates, [0007]). The one or more sensors is also shown as Sensor 201 in Figure 51.

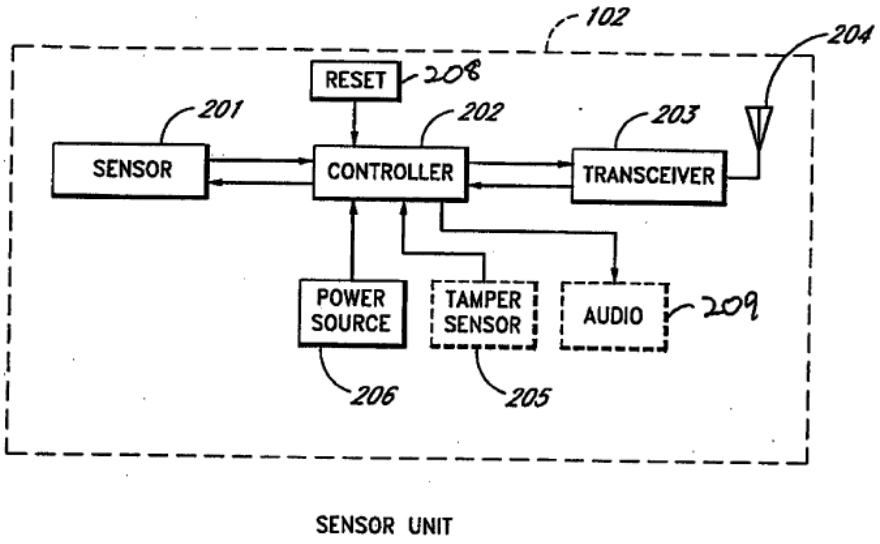


FIG.2

Reproduction of Figure 2 of Kates

784. The conditions described above (e.g., smoke, temperature, etc.) constitute the required "sensed condition" and the sensor unit waking up to communicate with the base unit or repeater fulfills the "indicator" required by claim element 1[b].

785. Thus, for at least the reasons detailed above, Kates discloses a sensor operable to generate an indicator for a sensed condition as required by claim element 1[b] of the '887 patent.

d. **1[c] a controller configured to poll the sensor at a polling interval to read the indicator during a current period of the polling interval and to selectively operate the transceiver to communicate information associated reading of the indicator; and**

786. Kates discloses a controller configured to poll the sensor at a polling interval to read the indicator during a current period of the polling interval and to selectively operate the transceiver to communicate information associated with the reading of the indicator, as required by claim element 1[c], for at least the following reasons.

787. Kates discloses a sensor system where "the sensor unit provides two wake-up modes, a first wake-up mode for taking measurements (and reporting such measurements if deemed necessary), and a second wake-up mode for listening for commands from the central reporting station. The two wake-up modes, or combinations thereof, can occur at different intervals" (Kates, [0009]). As would be understood by a POSITA, the second wake-up mode of Kates allows for the controller to poll the sensor unit by sending a command to the sensor unit. This is further exemplified by the disclosure of Kates whereby

> the repeater is configured to provide bi-directional communication between one or more sensors and a base unit. In one embodiment, the repeater is configured to receive instructions from the central reporting station (or repeater). Thus, for example, the central reporting station can instruct the repeater to: send commands to one or more sensors; go to standby mode; 'wake up'; report battery status; change wake-up interval; run self-diagnostics and report results; etc. (Kates, [0012]).

788. The above disclosure of Kates illustrates a controller which can communicate to remote sensor units through a repeater in order to poll the sensor units for reporting results, for example. As the disclosure of Kates centers on a wireless sensor system, a POSITA would understand that the communication would necessarily occur through one or more transceivers, as required by claim 1[c].

789. The sensor unit also "takes regular sensor readings and evaluates the readings to determine if an anomalous condition exists" (Kates, [0007], [0033]). The sensor unit contains a controller shown as Controller 202 in Figure 2 (Kates, [0050]-[0052], [0063]-[0064]). The controller controls the operations of the sensor unit, including "provid[ing] power, data, and control information to the sensor(s) 201 and the transceiver 202," "receiv[ing] sensor data from the sensor(s) 201," converting analog sensor data into a digital format, and "evaluat[ing] the sensor data by comparing the data value to a threshold value (e.g., a high threshold, a low threshold, or a high-low threshold)"

(Kates, [0052]). The sensor unit may take readings "at periodic intervals," which a POSITA would understand as being performed by the controller polling the sensor at intervals to obtain a reading. (Kates, [0033], Figures 6, 7). Further, Kates discloses that controller evaluates the obtained sensor data, compares the data to a pre-programmed threshold, and operates the transceiver such that "[i]f the data is outside the threshold (e.g., above a high threshold, below a low threshold, outside an inner range threshold, or inside an outer range threshold), then the data is deemed to be anomalous and is transmitted to the base unit 112" (Kates, [0052]). Thus, a POSITA would understand that the controller controls the processes of the sensor unit, including the taking of regular sensor readings, performing the self-diagnostic and reporting the results to the base unit, and controlling the transceiver to selectively transmit information associated with the reading of the indicator.

790. Thus, for at least the reasons detailed above, Kates discloses a controller configured to poll the sensor at a polling interval to read the indicator during a current period of the polling interval and to selectively operate the transceiver to communicate information associated with the reading of the indicator as required by claim element 1[c] of the '887 patent.

e. **1[d] a memory, the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval,**

791. Kates discloses a memory, the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval, as required by claim element 1[d], for at least the following reasons.

792. Kates discloses that the sensor unit contains a controller shown as Controller 202 in Figure 2. (Kates, [0050]-[0052], [0063]-[0064]). The controller controls the operations of the sensor unit, including "provid[ing] power, data, and control information to the sensor(s) 201 and the

transceiver 202," "receiv[ing] sensor data from the sensor(s) 201," converting analog sensor data into a digital format, and "evaluat[ing] the sensor data by comparing the data value to a threshold value (e.g., a high threshold, a low threshold, or a high-low threshold)" (*Id*.). Kates discloses that "[i]n one embodiment, the data threshold is programmed into the controller 202" (Kates, [0052]). Kates further explains that "[i]n one embodiment, the controller 202 is a conventional programmable microcontroller. In one embodiment, the controller 202 is based on a Field Programmable Gate Array (FPGA), such as, for example, provided by Xilinx Corp." (Kates, [0051]). FPGAs manufactured by Xilinx did include memory in communication with the processor. For example, the Virtex-5 FPGA[9], available by Xilinx in 2008, has Enhanced 36 kbit BlockRAM and an option for commodity flash memory. The Virtex-4 FPGA, also available by Xilinx in 2006, has up to 10Mbits Block RAM.[10] Further, a POSITA would have known that sensor unit must contain memory (either as part of Controller 202 or as a separate component) in order for the sensor unit to operate as described. In particular, in order for the sensor unit to store the pre-programmed thresholds as described, and in order for the sensor unit to compare the sensor readings to such thresholds as described, a POSITA would have understood that a memory must exist within the sensor unit that stores sensor readings. Further, a POSITA would have understood, in view of the operations disclosed in Kates, that such memory would store at least one prior sensor reading, where the memory stores at least one prior reading of the indicator, including in view of the comparisons and "periodic monitoring" and transmissions disclosed in Kates. At the very least, it would have been obvious to a POSITA to store such information in the sensor unit to carry out the disclosed functions, including in view of the energy savings goals described in Kates.

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[9] *See* Virtex-5 product page by Xilinx Corporation, dated March 12, 2008, accessed April 19, 2023. Virtex-5 Multi-Platform FPGA (archive.org); ecobee-Ollnova-000091580-581.

[10] *See* https://web.archive.org/web/20060311094736/, dated March 11, 2006, last accessed April 23, 2023.

793. Thus, for at least the reasons detailed above, Kates discloses a memory, the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval as required by claim element 1[d] of the ’887 patent.

f. **1[e] wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a chance in the sensed condition within the predetermined range.**

794. Kates discloses a wireless automation device wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a change in the sensed condition within the predetermined range, as required by claim element 1[e].

795. Kates discloses

> using sensors that require relatively little power, while in the low power mode the sensor unit 102 takes regular sensor readings and evaluates the readings to determine if an anomalous condition exists. In one embodiment, using sensors that require relatively more power, while in the low power mode the sensor unit 102 takes and evaluates sensor readings at periodic intervals. If an anomalous condition is detected, then the sensor unit 102 ‘wakes up’ and begins communicating with the base unit 112 through the repeater 110 (Kates, [0033]).

796. In the above description by Kates, the sensor unit will periodically wake up and begin communicating with the base unit when an “anomalous condition” is detected, which corresponds

to the required transmission of a most recent reading in response to a change in the sensed condition outside of the predetermined range. On the other hand, Kates discloses that "[t]he sensor unit 102 generally conserves power by not transmitting data that falls within a normal range" and "[i]f the data is outside the threshold (e.g., above a high threshold, below a low threshold, outside an inner range threshold, or inside an outer range threshold), then the data is deemed to be anomalous and is transmitted to the base unit 112" (Kates, [0052]; *see* also Kates, Abstract, [0005]-[0007], [0032], [0033], [0079], claim 1). As a method of saving power, data that would otherwise be transmitted during a transmission event is not transmitted by the sensor unit 102 unless an anomalous condition (i.e., data outside of predetermined thresholds) occurs, constituting a suspension of transmission, as required by claim element 1[e]. In other words, a transmission that would otherwise occur is stopped upon determination that the sensor data is within a pre-programmed threshold.

797. Thus, for at least the reasons detailed above, Kates discloses a wireless automation device wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a change in the sensed condition within the predetermined range, as required by claim element 1[e] of the '887 patent.

ii. Claim 11

798. Claim 11 of the '887 patent recites:

> The wireless automation device of claim 1 where the transmission interval is variable.

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799. Claim 11 of the ’887 patent depends upon claim 1, and places additional limitations pertaining to the data transmission interval. In particular, claim 11 requires that the transmission interval from the sensor unit is variable. For at least the reasons below, it is my opinion that each and every limitation added to claim 1 of the ’887 patent by claim 11 is also disclosed, anticipated, or rendered obvious by Kates.

800. Kates discloses that “the base unit 112 can instruct the repeater to: send commands to one or more sensors; go to standby mode; ‘wake up’; report battery status; *change wake-up interval*; run self-diagnostics and report results; etc.” (Kates, [0045] *emphasis added*). The modification of the wake-up interval corresponds to a variable transmission interval as required by claim 11, where “[a]t programmed intervals, the sensor unit 102 also ‘wakes up’ and sends status information (e.g., power levels, self[-]diagnostic information, etc.) to the base unit (or repeater)” (Kates, [0033]). As a result, Kates discloses a variable transmission interval as required by claim 11.

801. Thus, for at least the reasons detailed above, Kates satisfies all limitations added to claim 1 by claim 11 of the ’887 patent.

iii.Claim 12

802. Claim 12 of the ’887 patent recites:

> The wireless automation device of claim 11, where the polling interval is variable.

803. Claim 12 of the ’887 patent depends upon claim 11, and places additional limitations on the timing of the polling interval. In particular, claim 12 requires that the length of time between polls from the base unit to the sensor unit is variable. For at least the reasons below, it is my opinion that each and every limitation added to claim 11 of the ’887 Patent by claim 12 is also disclosed, anticipated, or rendered obvious by Kates.

804. Kates discloses "[i]n one embodiment, the sensor unit provides two wake-up modes, a first wake-up mode for taking measurements (and reporting such measurements if deemed necessary), and a second wake-up mode for listening for commands from the central reporting station. The two wake-up modes, or combinations thereof, can occur at different intervals" (Kates, [0009]). As a POSITA would understand, the variable interval of the two wake-up modes, and combinations thereof, corresponds to a variable polling interval. The sensor unit can be polled during the "second wake-up mode" during which commands, including requests for measurement or other data, can be received and followed by the sensor unit.

805. Thus, for at least the reasons detailed above, Kates satisfies all limitations added to claim 11 by claim 12 of the '887 patent.

iv.Claim 20

806. Claim 20 of the '887 patent recites:

> The wireless automation device of claim 1 where the controller is configured to poll the sensor during a period of the transmission interval to read the indicator during a current period of the transmission interval.

807. Claim 20 of the '887 patent depends upon claim 1 and places additional limitations on when the sensor is polled and what is done during the polling. In particular, the controller will poll the sensor to read the indicator during that same period of the transmission interval. For at least the reasons below, it is my opinion that each and every limitation added to claim 1 of the '887 patent by claim 20 is also disclosed, anticipated, or rendered obvious by Kates.

808. Kates discloses "[i]n one embodiment, the sensor unit 102 provides two wake-up modes, a first wake-up mode for taking measurements (and reporting such measurements if deemed necessary), and a second wake-up mode for listening for commands from the central reporting

station. The two wake-up modes, or combinations thereof, can occur at different intervals" (Kates, [0035]). This is further exemplified by the disclosure of Kates whereby

> the repeater is configured to provide bi-directional communication between one or more sensors and a base unit. In one embodiment, the repeater is configured to receive instructions from the central reporting station (or repeater). Thus, for example, the central reporting station can instruct the repeater to: send commands to one or more sensors; go to standby mode; 'wake up'; report battery status; change wake-up interval; run self-diagnostics and report results; etc. (Kates, [0012]).

809. The above disclosure of Kates illustrates a controller which can communicate to remote sensor units through a repeater in order to poll the sensor units for e.g., reporting results. As the disclosure of Kates centers on a wireless sensor system, a POSITA would understand that the communication would necessarily occur through one or more transceivers, as required by claim 1[c].

810. The sensor unit also "takes regular sensor readings and evaluates the readings to determine if an anomalous condition exists" (Kates, [0007], [0033]). The sensor unit contains a controller shown as Controller 202 in Figure 2 (Kates, [0050]-[0052], [0063]-[0064]). The controller controls the operations of the sensor unit, including "provid[ing] power, data, and control information to the sensor(s) 201 and the transceiver 202," "receiv[ing] sensor data from the sensor(s) 201," converting analog sensor data into a digital format, and "evaluat[ing] the sensor data by comparing the data value to a threshold value (e.g., a high threshold, a low threshold, or a high-low threshold)" (Kates, [0052]). The sensor unit may take readings "at periodic intervals," which a POSITA would understand as being performed by the controller polling the sensor at intervals to obtain a reading. (Kates, [0033], Figures 6, 7). Further, Kates discloses that controller evaluates the obtained sensor data, compares the data to a pre-programmed threshold, and operates the transceiver such that "[i]f the data is outside the threshold (e.g., above a high threshold, below a low threshold, outside an

inner range threshold, or inside an outer range threshold), then the data is deemed to be anomalous and is transmitted to the base unit 112" (Kates, [0052]). As described above, the controller controls the operations of the sensor unit, including the sensors (including polling of the sensors to read and indicator) and the transceiver (Kates, [0052]).

811. Thus, for at least the reasons detailed above, Kates satisfies all limitations added to claim 1 by claim 20 of the '887 patent.

v.Claim 21

812. Claim 21 of the '887 patent recites:

> The wireless automation device of claim 20 where the controller is configured to operate the transceiver to communicate information associated reading of the indicator during the current period of the transmission interval.

813. Claim 21 of the '887 patent depends upon claim 20, and places additional limitations on information communicated by the controller operating the transceiver. In particular, the controller operates the transceiver to communicate information associate with a reading of an indicator during the current period of the transmission interval. For at least the reasons below, it is my opinion that each and every limitation added to claim 20 of the '887 Patent by claim 21 is also disclosed, anticipated, or rendered obvious by Kates.

814. Kates discloses "[i]n one embodiment, the sensor unit 102 provides two wake-up modes, a first wake-up mode for taking measurements (and reporting such measurements if deemed necessary), and a second wake-up mode for listening for commands from the central reporting station. The two wake-up modes, or combinations thereof, can occur at different intervals" (Kates, [0035]). Furthermore, Kates also describes that "the base unit 112 can instruct the sensor unit 102 to perform additional measurements, to go to a standby mode, to wake up, to report battery status, to change wake-up interval, to run self-diagnostics and report results, etc." (Kates, [0034]). As

described in the above disclosures by Kates, the sensor unit reports the result of reading the indicator to the base unit (i.e., report results). The controller controls the operations of the sensor unit, including the sensors and the transceiver (Kates, [0052]). Additionally, a POSITA would understand that a transceiver is used to wirelessly communicate this information from a sensor unit to a transceiver associated with the base unit (*see* e.g., transceiver 203 of the sensor unit and transceiver 402 of the base unit).

815. Thus, for at least the reasons detailed above, Kates satisfies all limitations added to claim 20 by claim 21 of the ’887 patent.

D. Claims 1, 11, 12, 20, and 21 of the ’887 patent are anticipated or obvious to a POSITA in view of Helgeson

i. Claim 1

816. Claim 1 of the ’887 patent recites:

> A wireless automation device, comprising:
>
> a transceiver operable to wirelessly communicate packets of information over a wireless network;
>
> a sensor operable to generate a [*sic*] indicator for a sensed condition;
>
> a controller configured to poll the sensor at a polling interval to read the indicator during a current period of the polling interval and to selectively operate the transceiver to communicate information associated reading of the indicator; and
>
> a memory, the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval,
>
> wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent reading of the indicator stored in the memory during the period of the

transmission interval is suspended in response to detecting a chance in the sensed condition within the predetermined range.

817. Thus, claim 1 of the ’887 patent is directed towards a wireless automation device, and includes limitations pertaining to the content and timing of bi-directional communication between a remote device and a base unit. For at least the reasons detailed below, each and every limitation of claim 1 of the ’887 patent is disclosed by Helgeson, and, consequently, this claim is invalid as anticipated or obvious to a POSITA in view of Helgeson.

a. **1[pre] A wireless automation device, comprising:**

818. To the extent that the preamble of claim 1 of the ’887 Patent is limiting, Helgeson discloses a wireless automation device for at least the following reasons.

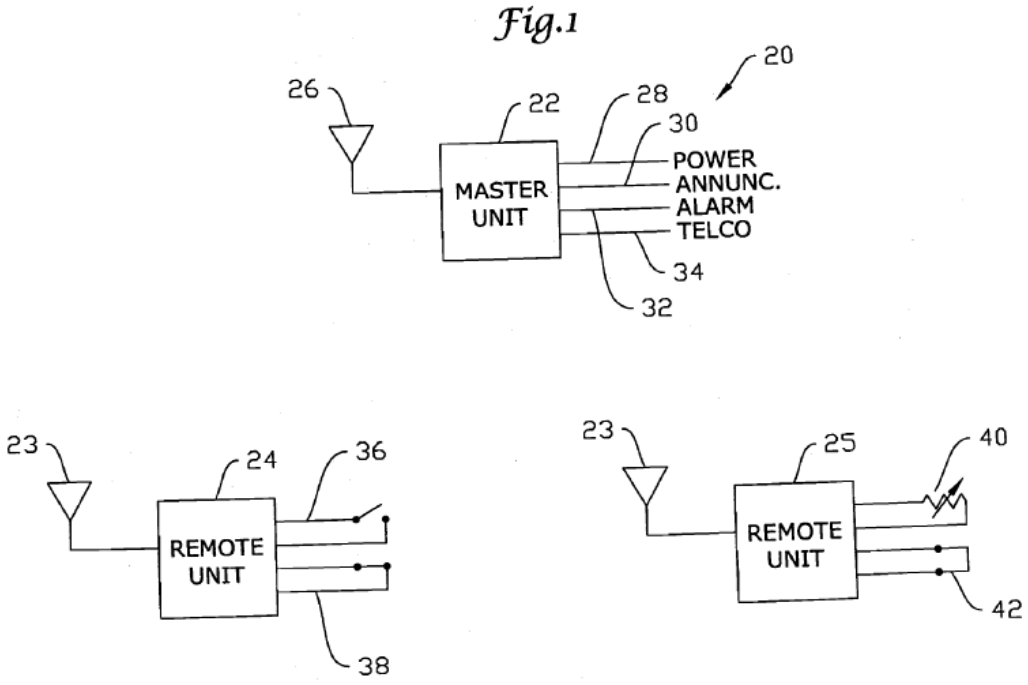
819. Helgeson discloses a wireless automation device. For example Helgeson describes a “[b]uilding monitoring and control systems including bi-directional radio frequency links between master and remote units” (Helgeson, Abstract). Helgeson describes, in Figure 1, “a wireless control system 20 including a master unit 22 and two wireless remote units 24 and 25.” (Helgeson, [0023]). The master and remote units contain programming such that the devices perform functions automatically within an automation system (See Helgeson, [0008], [0026], [0028]-[0030], [0032], [0052]). A POSITA would understand that the mater and remote units are wireless automation devices.

820. Thus, for at least the reasons detailed above, Helgeson discloses a wireless automation device as required by the preamble to claim 1 of the ’887 patent.

b. **1[a] a transceiver operable to wirelessly communicate packets of information over a wireless network;**

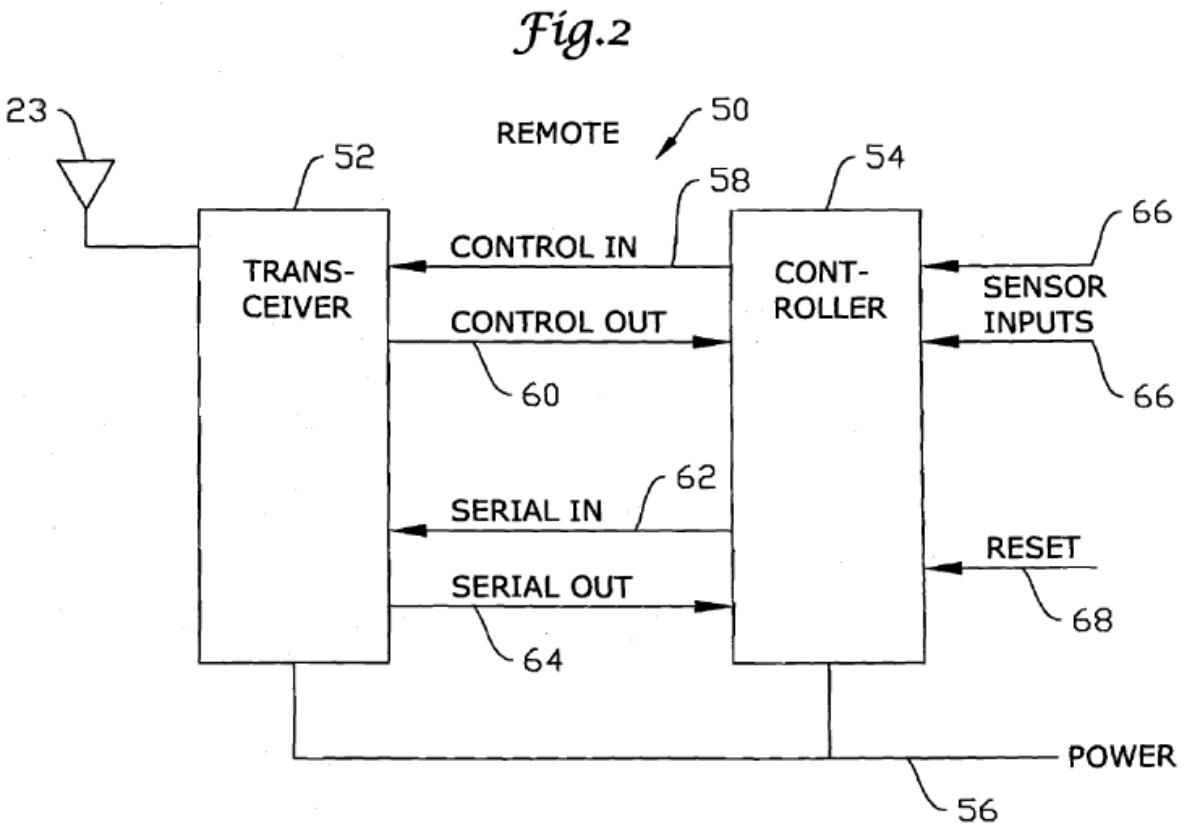
821. Helgeson discloses a transceiver operable to wirelessly communicate packets of information over a wireless network, as required by claim element 1[a], for at least the following reasons.

822. As can be seen in Figure 1 of Helgeson, reproduced below, master and remote units contain antennas (23, 26) for wireless communications (Helgeson, Figure 1, [0023], [0026]).



Reproduction of Figure 1 of Helgeson

823. Further, as can be seen in Figure 2 of Helgeson, a transceiver 52 is operatively connected to a controller 54 and an antenna 23 for wireless communications.



Reproduction of Figure 2 of Helgeson showing a block diagram for a sensor unit

824. Additionally, Helgeson discloses functionality of the transceiver, wherein "[t]ransceiver 52, in one embodiment, can be set to transmit and receive on different frequencies and to rapidly switch between frequencies" (Helgeson, [0026]). As a POSITA would understand, the transceiver 52 wirelessly communicates packets of information over a wireless network as required by claim element 1[a].

825. Thus, for at least the reasons detailed above, Helgeson discloses a transceiver operable to wirelessly communicate packets of information over a wireless network as required by claim element 1[a] of the '887 patent.

c. **1[b] a sensor operable to generate a [*sic*] indicator for a sensed condition;**

826. Helgeson discloses a sensor operable to generate an indicator for a sensed condition, as required by claim element 1[b], for at least the following reasons.

827. Helgeson discloses that "[t]he system can include at least one master unit and a plurality of remote units, the remote units being typically coupled to sensors for measuring and/or controlling security or building environment variables." (Helgeson, [0011]). Helgeson explains that "[s]ensors can also be used to measure analog or continuously variable properties of a building environment such as temperature, humidity, airflow, and hot water flow." (Helgeson, [0013]; see also Helgeson, [0023], [0024]). In Figure 2, Helgeson discloses "sensor inputs" 66 to controller 54. (Helgeson, [0028], Figure 2). Helgeson discloses that "remote units can be configured or programmed to transmit sensor data only on a timeout occurrence or on a change occurrence. For example, a temperature sensor may be configured to transmit every half-hour or upon a one (1) degree change from last transmission" (Helgeson, [0032]). In this example, the transmission of data occurs when a temperature sensor senses a one-degree change in temperature, where the transmission of data constitutes the indicator and the one-degree change in temperature is the sensed condition, as required by claim element 1[b].

828. Thus, for at least the reasons detailed above, Helgeson discloses a sensor operable to generate an indicator for a sensed condition as required by claim element 1[b] of the '887 patent.

d. **1[c] a controller configured to poll the sensor at a polling interval to read the indicator during a current period of the polling interval and to selectively operate the transceiver to communicate information associated reading of the indicator; and**

829. Helgeson discloses a controller configured to poll the sensor at a polling interval to read the indicator during a current period of the polling interval and to selectively operate the

transceiver to communicate information associated with the reading of the indicator, as required by claim element 1[c], for at least the following reasons.

830. Helgeson states that "[c]ontroller 54 includes a programmable microprocessor such as the PIC microprocessor in one embodiment," and "[i]n the embodiment illustrated, controller 54 is coupled to transceiver 52 with control input line 58, control output line 60, serial input line 62, and serial output line 64." (Helgeson, [0026]). Helgeson further explains that "[c]ontrol input line 58 can be used to reset the transceiver, to set modes, and to set transmit and receive frequencies," and "[c]ontrol output line 60 can be used by signal controller 54 to determine when communication receptions or transmissions have been completed." (Helgeson, [0027]). Helgeson further explains that "[s]erial input line 62 can be used to feed messages to be transmitted to transceiver 52 as well as frequencies to be used and other control parameters," and "[s]erial output line 64 can be used to provide messages received from transceiver 52 to controller 54 and can be used to convey information about signal strength to controller 54." (Helgeson, [0027]). Helgeson further discloses that the controller receives sensor data from sensor input lines 66. (Helgeson, [0028]). Thus, a POSITA would understand that the controller controls the processes of the remote unit, including the taking of regular sensor readings, and reporting the results to the master unit, and controlling the transceiver to selectively transmit information associated with the reading of the indicator.

831. Helgeson discloses "[i]n a preferred embodiment, at least three events can awaken the transceiver from the sleep mode… [a]nother event is the lapse of a preset time interval, such as the lapse of the time interval between scheduled health status transmissions by the remote, or between scheduled health status polls initiated by the master unit for which the remote desires to be awake" (Helgeson, [0031]). In this example, the "scheduled health status polls" of the remote unit by the

master unit constitute a "controller configured to poll the sensor at a polling interval." For example, in claim 20, Helgeson discloses the feature "the remote units are capable of transmitting to and receiving from the master unit of the building monitoring and control system and capable of generating polling events in response to a poll message received from the master unit." (Helgeson, claim 20; see also Helgeson, [0012], [0037]-[0038]). Furthermore, Helgeson additionally discloses "[i]n one method, a POLL REQUEST 117 is received from the master unit and the remote unit transitions to a TRANSMITTING HEALTH state 118" and "[i]n some embodiments, sensor data is included in the TRANSMITTING HEALTH transmission" (Helgeson, [0038, 0040]). The result of the above poll request is the transmission of at least sensor data, which corresponds to the "reading of the indicator" as required by claim element 1[c].

832. Thus, for at least the reasons detailed above, Helgeson discloses a controller configured to poll the sensor at a polling interval to read the indicator during a current period of the polling interval and to selectively operate the transceiver to communicate information associated with the reading of the indicator as required by claim element 1[c] of the '887 patent.

e. **1[d] a memory, the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval,**

833. Helgeson discloses a memory, the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval, as required by claim element 1[d], for at least the following reasons.

834. Helgeson discloses multiple measurements which are compared to each other

> [i]n one example of the invention, a message is received from a remote unit indicating the opening of a window. The lookup table for that type of device indicates that two readings are required and that the second

> reading should be taken in 0.5 seconds… The remote unit reads the window sensor again after 0.5 seconds and transmits the value to the master unit. The master unit can then report out that the window opened if both readings agree (Helgeson, [0051]).

835. As a POSITA would understand, a first measurement being taken and subsequently compared to a second measurement would necessarily require that at least the first measurement be stored in a memory, followed by the second measurement being stored in the memory for comparison. In this manner, the disclosure of Helgeson satisfies the requirements of claim element 1[d].

836. Helgeson also states that "[c]ontroller 54 includes a programmable microprocessor such as the PIC microprocessor in one embodiment," and "[i]n the embodiment illustrated, controller 54 is coupled to transceiver 52 with control input line 58, control output line 60, serial input line 62, and serial output line 64." (Helgeson, [0026]). Helgeson further explains that "[c]ontrol input line 58 can be used to reset the transceiver, to set modes, and to set transmit and receive frequencies," and "[c]ontrol output line 60 can be used by signal controller 54 to determine when communication receptions or transmissions have been completed." (Helgeson, [0027]). Helgeson further explains that "[s]erial input line 62 can be used to feed messages to be transmitted to transceiver 52 as well as frequencies to be used and other control parameters," and "[s]erial output line 64 can be used to provide messages received from transceiver 52 to controller 54 and can be used to convey information about signal strength to controller 54." (Helgeson, [0027]). Helgeson further discloses that the controller receives sensor data from sensor input lines 66. (Helgeson, [0028]). Further, a POSITA would have known that remote unit must contain memory (either as part of the controller or as a separate component) in order for the sensor unit to operate as described. In particular, in order for the sensor unit to store the pre-programmed thresholds as described, and in order for the sensor unit to receive and transmit sensor data periodically, or after

the occurrence of an event, or to conduct polling (including in response to an initiation by a master unit), a POSITA would have understood that a memory must exist within the remote unit that stores sensor readings. Further, a POSITA would have understood, in view of the operations disclosed in Helgeson, that such memory would store at least one prior sensor reading, where the memory stores at least one prior reading of the indicator, including in view of the comparisons and transmission at "periodic intervals" disclosed in Helgeson. At the very least, it would have been obvious to a POSITA to store such information in the remote unit to carry out the disclosed functions, including in view of the energy savings goals described in Helgeson.

837. Thus, for at least the reasons detailed above, Helgeson discloses the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval as required by claim element 1[d] of the '887 patent.

f. **1[e] wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a chance in the sensed condition within the predetermined range.**

838. Helgeson discloses a wireless automation device wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a change in the sensed condition within the predetermined range, as required by claim element 1[e].

839. Helgeson discloses "[i]n a preferred embodiment, at least three events can awaken the transceiver from the sleep mode. One event is the occurrence of a sensor data change, such as a door switch opening, or a significant percentage change of an analog variable" (Helgeson, [0031]). Helgeson further discloses "[i]n one embodiment, remote units can be configured or programmed to transmit sensor data only on a timeout occurrence or on a change occurrence" (Helgeson, [0032]). For example, Helgeson explains that "a temperature sensor may be configured to transmit every half-hour or upon a one (1) degree change from the last transmission," which "can greatly reduce power consumption." (Helgeson, [0032]). As a POSITA would understand, the "significant percentage change of an analog variable" of Helgeson constitutes a required change in the sensed condition outside of a predetermined range, as required by claim element 1[e]. The data can then be transmitted "on a change occurrence," and therefore when a sensor data change occurs the data is transmitted. Helgeson discusses data transmission when there is a "significant percentage change of an analog variable," where a POSITA would understand that the significant percentage change represents a threshold, where data transmission that would otherwise occur is stopped when the change in the analog variable is below the threshold, but data transmission does happen when the change in the analog variable is above the threshold. In other words, in order to advance its energy-savings goals, Helgeson discloses that information may be transmitted only upon a determination that sensor data exceeds a pre-programmed threshold, where a transmission that would otherwise occur is stopped upon a determination that the sensor data is within a pre-programmed threshold.

840. Thus, for at least the reasons detailed above, Helgeson discloses a wireless automation device wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent

reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a change in the sensed condition within the predetermined range, as required by claim element 1[e] of the ’887 Patent.

ii.Claim 11

841. Claim 11 of the ’887 Patent recites:

> The wireless automation device of claim 1 where the transmission interval is variable.

842. Claim 11 of the ’887 Patent depends upon claim 1, and places additional limitations pertaining to the data transmission interval. In particular, claim 11 requires that the transmission interval from the sensor unit is variable. For at least the reasons below, it is my opinion that the limitation added to claim 1 of the ’887 patent by claim 11 is also disclosed, anticipated, or rendered obvious by Helgeson.

843. Helgeson discloses “[i]n a preferred embodiment, at least three events can awaken the transceiver from the sleep mode … Another event is the lapse of a preset time interval, such as the lapse of the time interval between scheduled health status transmissions by the remote” (Helgeson, [0031]). Additionally, Helgeson explains that “[i]n one embodiment, a time to wait until transmitting status information, such as 300 seconds, is received from the master unit during GETTING SLOT state 106. The time to wait can either be used directly or adjusted with a margin of error to insure that the remote unit is not sleeping when the time period has elapsed” (Helgeson, [0036]). In the above-disclosed examples from Helgeson, the transmission interval of data from the remote unit is varied based on instructions from the master unit, and so the transmission interval of the wireless automation device of Helgeson is variable, as required by claim 11.

844. Thus, for at least the reasons detailed above, Helgeson satisfies all limitations added to claim 1 by claim 11 of the ’887 patent.

iii.Claim 12

845. Claim 12 of the ’887 patent recites:

> The wireless automation device of claim 11, where the polling interval is variable.

846. Claim 12 of the ’887 patent depends upon claim 11, and places additional limitations on the timing of the polling interval. In particular, claim 12 requires that the length of time between polls from the base unit to the sensor unit is variable. For at least the reasons below, it is my opinion that each and every limitation added to claim 11 of the ’887 Patent by claim 12 is also disclosed, anticipated, or rendered obvious by Helgeson.

847. Helgeson discloses “[i]n one embodiment, a PIC microprocessor is implemented on the same chip as the transceiver using CMOS logic and the PIC microprocessor is user programmable in an interpreted BASIC or JAVA language” (Helgeson, [0028]). Helgeson further explains “[p]rogrammable input line 86 can be used for many purposes, including down loading [*sic*] control logic, inputting keyboard strokes, and inputting lines of BASIC or JAVA code to be interpreted and executed” (Helgeson, [0029]). A POSITA would understand that the ability of a user to program the microprocessor would allow for a modification of the length of the polling interval, as the functionality of the wireless automation device greatly depends on the time interval of data transmission. For example, various sensors with different sensing modalities would benefit from user-specified polling intervals, as not all sensor readings will change as rapidly as others, and not all sensor readings are as time-sensitive as others (e.g., a temperature sensor incorporated into an HVAC system may require less frequent polling than a carbon monoxide detector). To illustrate this point, Helgeson discloses “[i]n many embodiments of the present invention, the master controller or controllers may require additional programmable functionality relative to the functionality required on the remote units” (Helgeson, [0030]). Furthermore, Helgeson also

discloses that "[i]t is contemplated that the system mode can be changed on the fly, whereby the particular sensor may again be polled more often" (Helgeson, [0037]). Clearly, the disclosure of Helgeson includes discussion of a sensor being "polled more often," which constitutes a variable polling interval.

848. Thus, for at least the reasons detailed above, Helgeson satisfies all limitations added to claim 11 by claim 12 of the '887 patent.

iv.Claim 20

849. Claim 20 of the '887 patent recites:

> The wireless automation device of claim 1 where the controller is configured to poll the sensor during a period of the transmission interval to read the indicator during a current period of the transmission interval.

850. Claim 20 of the '887 patent depends upon claim 1, and places additional limitations on when the sensor is polled and what is done during the polling. In particular, the controller will poll the sensor to read the indicator during that same period of the transmission interval. For at least the reasons below, it is my opinion that each and every limitation added to claim 1 of the '887 patent by claim 20 is also disclosed, anticipated, or rendered obvious by Helgeson.

851. Helgeson discloses

> In one method, a POLL REQUEST 117 is received from the master unit and the remote unit transitions to a TRANSMITTING HEALTH state 118. While in the TRANSMITTING HEALTH state 118 or soon before, the remote unit transceiver can be put into a transmit state at the desired frequency. In one embodiment, the poll request includes the desired transmit frequency to use (Helgeson, [0038]).

852. As a POSITA would understand, the above disclosure from Helgeson includes descriptions of a controller configured to poll the sensor during a period of the transmission interval (i.e., the TRANSMITTING HEALTH state) to read the indicator.

853. Thus, for at least the reasons detailed above, Helgeson satisfies all limitations added to claim 1 by claim 20 of the ’887 patent.

v.Claim 21

854. Claim 21 of the ’887 patent recites:

> The wireless automation device of claim 20 where the controller is configured to operate the transceiver to communicate information associated reading of the indicator during the current period of the transmission interval.

855. Claim 21 of the ’887 patent depends upon claim 20, and places additional limitations on information communicated by the controller operating the transceiver. In particular, the controller operates the transceiver to communicate information associate with a reading of an indicator during the current period of the transmission interval. For at least the reasons below, it is my opinion that each and every limitation added to claim 20 of the ’887 patent by claim 21 is also disclosed, anticipated, or rendered obvious by Helgeson.

856. Helgeson discloses “[i]n a preferred embodiment, at least three events can awaken the transceiver from the sleep mode. One event is the occurrence of a sensor data change, such as a door switch opening, or a significant percentage change of an analog variable” (Helgeson, [0031]). Furthermore, Helgeson discloses an embodiment where “the remote, not including timing circuitry, initializes in a normal power consumption mode, sleeps in a very low power consumption mode, which, when interrupted, executes in a normal power consumption mode while transmitting or receiving” (Helgeson, [0033]). As a POSITA would understand, the disclosures of Helgeson include a controller which operates the transceiver to wirelessly communicate information which is associated with a reading of the indicator (i.e., a sensor data change).

857. Thus, for at least the reasons detailed above, Helgeson satisfies all limitations added to claim 20 by claim 21 of the ’887 patent.

E. Claims 1, 11, 12, 20, and 21 of the ’887 patent are anticipated or obvious to a POSITA in view of Lareau

i. Claim 1

858. Claim 1 of the ’887 patent recites:

> A wireless automation device, comprising:
>
> a transceiver operable to wirelessly communicate packets of information over a wireless network;
>
> a sensor operable to generate a indicator for a sensed condition;
>
> a controller configured to poll the sensor at a polling interval to read the indicator during a current period of the polling interval and to selectively operate the transceiver to communicate information associated reading of the indicator; and
>
> a memory, the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval,
>
> wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a chance in the sensed condition within the predetermined range.

859. Thus, claim 1 of the ’887 patent is directed towards a wireless automation device, and includes limitations pertaining to the content and timing of bi-directional communication between a remote device and a base unit. For at least the reasons detailed below, each and every limitation of claim 1 of the ’887 patent is disclosed by Lareau, and, consequently, this claim is invalid as anticipated or obvious to a POSITA in view of Lareau.

a. **1[pre] A wireless automation device, comprising:**

860. To the extent that the preamble of claim 1 of the ’887 patent is limiting, Lareau discloses a wireless automation device for at least the following reasons.

861. Lareau discloses a wireless automation device, for example Lareau describes a “solution for monitoring and tracking assets by utilizing wireless communications” (Lareau, Abstract).

862. Thus, for at least the reasons detailed above, Lareau discloses a wireless automation device as required by the preamble to claim 1 of the ’887 patent.

b. **1[a] a transceiver operable to wirelessly communicate packets of information over a wireless network;**

863. Lareau discloses a transceiver operable to wirelessly communicate packets of information over a wireless network, as required by claim element 1[a], for at least the following reasons.

864. Lareau explains that “[e]ach ID tag is coupled to an asset and is configured to wirelessly communicate with other ID tags in the network within a predetermined proximity,” where “[e]ach tag is also configured to relay communications from other ID tags so that a communication path is established between the RMS and any ID tag in the network, either directly or via other ID tags” (Lareau, [0010]).

865. Figure 6 of Lareau is a block diagram illustrating an exemplary wireless RF ID tag, which includes a transceiver 450 coupled to an antenna 452 capable of wirelessly communicating packets of information over a wireless network. (Lareau, [0065], [0070], [0079]).

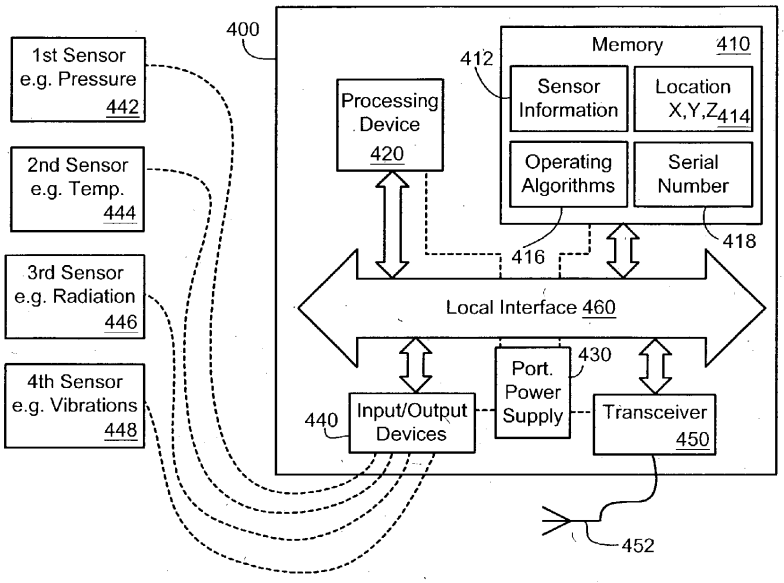


FIG. 6

Reproduction of Figure 6 of Lareau

866. As can be seen in Figure 5 of Lareau below, a transceiver is included in each Remote Monitoring Station for wireless communications. Additionally, Lareau discloses "a wireless ID tag coupled to an asset to be tracked, wherein the wireless ID tag is one of a network of ID tags configured to communicate with an RMS. The wireless ID tag includes a portable power supply and a transceiver configured to wirelessly communicate with other ID tags within a predetermined proximity" (Lareau, [0011]). Lareau explains that the network "may be any type of communication network in which various computing devices can communicate," including "but not limited to, the network 161 could be a Local Area Network (LAN) and/or a Wide Area Network (WAN) and could utilize the Internet," and "[t]he network 161 could be comprised of various hardware components such as routers and bridges (not shown) to facilitate the communication between the various interconnected devices" (Lareau, [0058]). The transceiver of Lareau clearly communicates information over a wireless network and therefore satisfies the requirements of claim element 1[a].

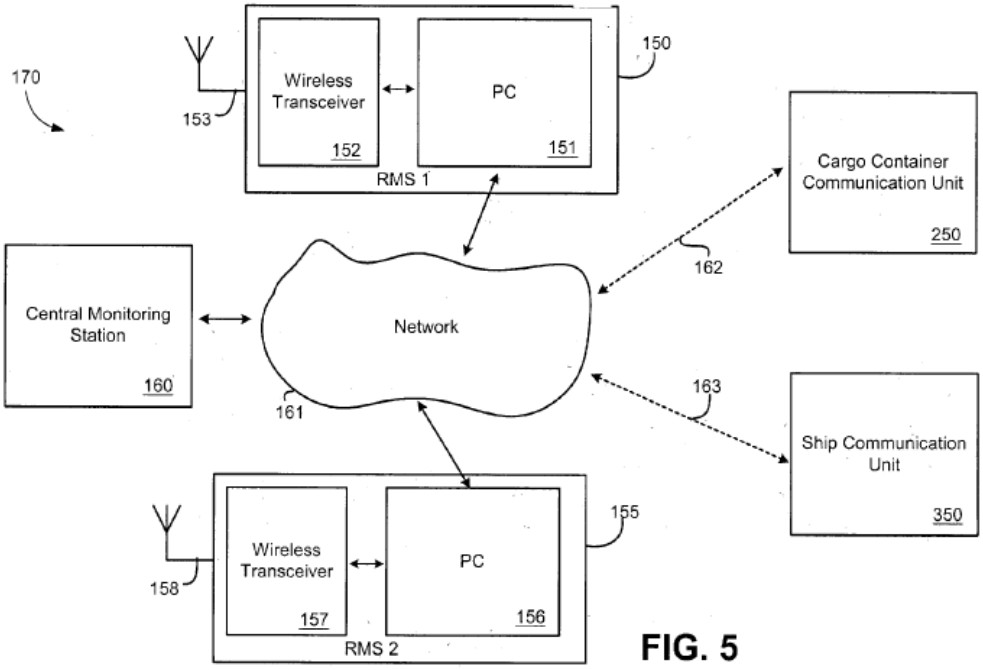


FIG. 5

Reproduction of Figure 5 of Lareau showing a wireless transceiver in each Remote Monitoring Station

867. Thus, for at least the reasons detailed above, Lareau discloses a transceiver operable to wirelessly communicate packets of information over a wireless network as required by claim element 1[a] of the '887 patent.

c. **1[b] a sensor operable to generate a [*sic*] indicator for a sensed condition;**

868. Lareau discloses a sensor operable to generate an indicator for a sensed condition, as required by claim element 1[b], for at least the following reasons.

869. Lareau discloses

> various environmental parameters may be monitored and communicated to the RMS 150. For example, temperature, air pressure, vibrations, humidity, and electromagnetic radiation, including ionizing radiation (i.e., alpha and gamma rays), can be sensed. The same general communication protocol can be used to communicate such information between RMS 150 and destination tag 110, via intermediate tags (Lareau, [0046]).

870. In the above disclosure, the temperature, air pressure, vibrations, humidity, and electromagnetic radiation, including ionizing radiation constitute sensed conditions, and the stored data that is communicated to the remote monitoring station, RMS 150, is known to a POSITA to be an indicator as required by claim element 1[b].

871. Figure 6 of Lareau is a block diagram illustrating an exemplary wireless RF ID tag, which various sensors, including sensors 442, 444, 446 and 448 (Lareau, [0071], [0072]).

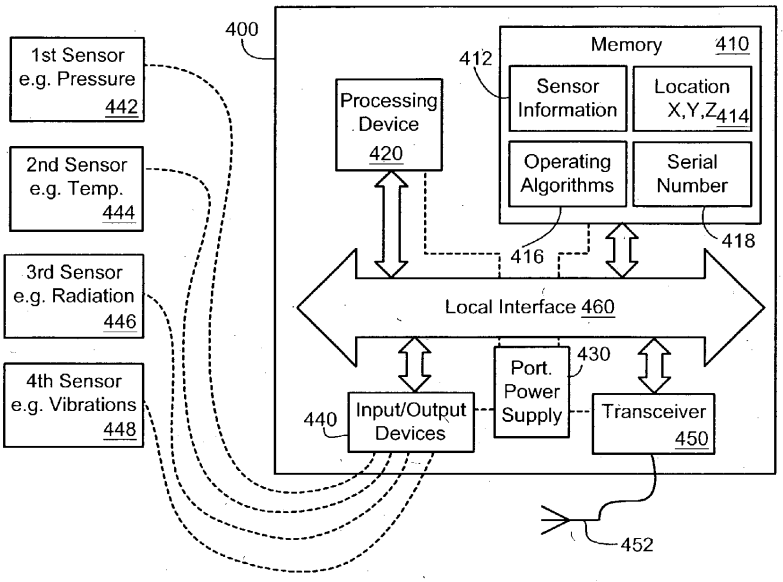


FIG. 6

Reproduction of Fig. 6 of Lareau

872. Lareau explains that "[t]he sensors 442, 444, 446, and 448 may be integrated with the tag 400 or, as shown in FIG. 6, may be exclusive to the tag 400 and connected to the tag 400 via the input/output interface 440" (Lareau, [0072]).

873. Lareau further discloses that "[v]arious sensor parameters are stored in the memory 410 along with recorded sensor data in the sensor information section 412," and that "[a]lso stored in the sensor information section 412 of the memory are previous readings of the sensors 442, 444, 446, and 448" (Lareau, [0076]-[0077]). A POSITA would understand that the information

generated by the sensors and stored in memory 410 serves as an indicator for a sensed condition. Further, Lareau discloses generating threshold exceedances for detected conditions, which serve as an indicator that sensor data has exceeded a threshold. The threshold exceedances are also stored in memory 410 (Lareau, [0077]).

874. Thus, for at least the reasons detailed above, Lareau discloses a sensor operable to generate an indicator for a sensed condition as required by claim element 1[b] of the '887 patent.

d. **1[c] a controller configured to poll the sensor at a polling interval to read the indicator during a current period of the polling interval and to selectively operate the transceiver to communicate information associated reading of the indicator; and**

875. Lareau discloses a controller configured to poll the sensor at a polling interval to read the indicator during a current period of the polling interval and to selectively operate the transceiver to communicate information associated with the reading of the indicator, as required by claim element 1[c], for at least the following reasons.

876. Lareau states that "temperature, air pressure, vibrations, humidity, and electromagnetic radiation, including ionizing radiation (i.e., alpha and gamma rays), can be sensed. The same general communication protocol can be used to communicate such information between RMS 150 and destination tag 110, via intermediate tags" (Lareau, [0046]). Lareau explains that "[t]he processor 420 is a hardware device for executing software or firmware, particularly that stored in memory 410. A POSITA would understand that the processor 420 controls the operations of the RF ID tag based on execution of software or firmware, and in response to communications received from, for example, the RMS (*see*, e.g., Lareau, [0108]-[0109], Fig. 10). For example, Lareau explains that the RMS may issue a 'READINGS' command to each tag, whereafter the tag "may then retrieve this information from its memory and reply back accordingly" (Lareau, [0109]).

877. Furthermore, Lareau discloses that the method "polls each of the tags in the network to find out the environmental conditions in which their assets are experiencing" (Lareau, [0107]). Additionally, Lareau describes "[o]nce the RMS has been triggered to poll the network (step 604), the network may be polled (step 630)… in brief, any environmental parameter exceedances, as well as location coordinate information may be requested of each tag in the network. The RMS then receives responses conveying this information from the tags in the network" (Lareau, [0099]). The disclosures of Lareau clearly discuss a controller polling a sensor for reading the indicator for communicating back to the controller. A POSITA would have understood that the processor would perform the polling of the RF ID tag in response to polling commands received from the RMS.

878. Thus, for at least the reasons detailed above, Lareau discloses a controller configured to poll the sensor at a polling interval to read the indicator during a current period of the polling interval and to selectively operate the transceiver to communicate information associated with the reading of the indicator as required by claim element 1[c] of the '887 patent.

e. **1[d] a memory, the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval,**

879. Lareau discloses a memory, the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval, as required by claim element 1[d], for at least the following reasons.

880. Lareau discloses that "[v]arious sensor parameters are stored in the memory 410 along with recorded sensor data in the sensor information section 412" (Lareau, [0076]). In this disclosure by Lareau, the recorded sensor data and sensor parameters are stored in the memory, and specifically in the sensor information section 412. As a POSITA would understand, the recorded sensor data

would include current sensor readings as well as prior sensor readings, as required by claim element 1[d]. Furthermore, Lareau discloses "[a]lso stored in the sensor information section 412 of the memory are previous readings of the sensors 442, 444, 446, and 448" (Lareau, [0077]). Lareau further states that "the sensor information section 412 may be large enough to hold three prior readings for each sensor 442, 444, 446, or 448," and "threshold exceedances for each sensor 442, 444, 446, or 448 may be triggered at any reading and stored in the sensor information section 412." (Lareau, [0077]; see also [0019]). The previous readings stored in the memory of Lareau correspond to the prior readings of the indicator, as required by claim element 1[d].

881. Thus, for at least the reasons detailed above, Lareau discloses the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval as required by claim element 1[d] of the '887 patent.

f. **1[e] wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a chance in the sensed condition within the predetermined range.**

882. Lareau discloses a wireless automation device wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a change in the sensed condition within the predetermined range, as required by claim element 1[e].

883. Lareau discloses that "threshold exceedances for each sensor 442, 444, 446, or 448 may be triggered at any reading and stored in the sensor information section 412. Upon a command from the RMS, the data, such as the sensor readings and threshold exceedances can be communicated back to the RMS" (Lareau, [0077]). As discussed by Lareau, the threshold exceedances are communicated back to the RMS, however if no threshold exceedance is recorded, there is no threshold exceedance to communicate back to the RMS, and the communication of such information is stopped until a polling period in which a threshold exceedance is determined.

884. In particular, Lareau states:

> To poll each tag, a 'READINGS' command may be sent to each tag (step 633). The tag may then retrieve this information from its memory and reply back accordingly. As each reply is received by the RMS (step 634), the RMS can store the responses (step 635) as well as monitor for any threshold exceedances that have occurred (step 636). If a threshold exceedance has occurred, the pertinent information will be recorded and may be communicated to the CMS (step 637). Such pertinent information may include the time of exceedance, the specific tag that replied with the exceedance, and the location of the specific tag. The responses may also include the actual readings of the sensors, so if an exceedance is recognized, the sensor readings can be communicated to the CMS. Without an exceedance being detected, the information may or may, not be recorded (depending on the specific configuration) nor communicated to CMS. This process continues until each desired tag has been polled for its readings (Lareau, [0109], Fig. 10).

885. Thus, a POSITA would understand that in Lareau, the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a threshold. However, the transmission of that information that would otherwise occur may be stopped ("not communicated") during the transmission interval corresponding to the period in which the request command is received in response to detecting a chance in the sensed condition within the threshold.

886. Thus, for at least the reasons detailed above, Lareau discloses a wireless automation device wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a change in the sensed condition within the predetermined range, as required by claim element 1[e] of the ’887 patent.

ii.Claim 11

887. Claim 11 of the ’887 patent recites:

> The wireless automation device of claim 1 where the transmission interval is variable.

888. Claim 11 of the ’887 Patent depends upon claim 1, and places additional limitations pertaining to the data transmission interval. In particular, claim 11 requires that the transmission interval from the sensor unit is variable. For at least the reasons below, it is my opinion that each and every limitation added to claim 1 of the ’887 Patent by claim 11 is also disclosed, anticipated, or rendered obvious by Lareau.

889. Lareau discloses that “[s]uch variable parameters may include the time between two successive sensor readings and threshold limits. For example, the time between successive readings may be on the order of 15 minutes or 120 minutes” (Lareau, [0076]). As a result, the transmission interval for the wireless automation device of Lareau is variable, in this example between 15 and 120 minutes, as required by claim 11.

890. Thus, for at least the reasons detailed above, Lareau satisfies all limitations added to claim 1 by claim 11 of the ’887 patent.

iii.Claim 12

891. Claim 12 of the ’887 patent recites:

> The wireless automation device of claim 11, where the polling interval is variable.

892. Claim 12 of the ’887 patent depends upon claim 11, and places additional limitations on the timing of the polling interval. In particular, claim 12 requires that the length of time between polls from the base unit to the sensor unit is variable. For at least the reasons below, it is my opinion that each and every limitation added to claim 11 of the ’887 Patent by claim 12 is also disclosed, anticipated, or rendered obvious by Lareau.

893. Lareau discloses “the RMS can send out the polling signals to the network of tags over an extended period of time in a pseudo-random fashion” (Lareau, [0108]). Given that the period of time between polling events is not fixed, the disclosure of Lareau inherently supports a variable polling interval, as required by claim 12. Additionally, Lareau discloses a method of polling that is used to reform the network of tags, whereby “[p]eriodically, the RMS 150 may reform the network of tags. The method in which the RMS 150 can accomplish this is described in further detail in FIG. 8. In short, the RMS 150 sends out repetitive broadcast signals and waits for replies to come back. Once all of the replies are from tags already having replied, the RMS 150 is aware of the tags in the surrounding network” and “[t]he periodicity of reforming the network may vary according to the asset traffic within the facility 70” (Lareau, [0041, 0042]). Furthermore, Lareau discloses that “each tag in the network may be polled to see if any preprogrammed sensor thresholds have been exceeded since the last poll” (Lareau, [0050]). The preceding examples clearly demonstrate the variability of the polling interval in the disclosure of Lareau.

894. Thus, for at least the reasons detailed above, Lareau satisfies all limitations added to claim 11 by claim 12 of the ’887 patent.

iv.Claim 20

895. Claim 20 of the ’887 patent recites:

> The wireless automation device of claim 1 where the controller is configured to poll the sensor during a period of the transmission interval to read the indicator during a current period of the transmission interval.

896. Claim 20 of the ’887 patent depends upon claim 1, and places additional limitations on when the sensor is polled and what is done during the polling. In particular, the controller will poll the sensor to read the indicator during that same period of the transmission interval. For at least the reasons below, it is my opinion that each and every limitation added to claim 1 of the ’887 Patent by claim 20 is also disclosed, anticipated, or rendered obvious by Lareau.

897. Lareau states that “temperature, air pressure, vibrations, humidity, and electromagnetic radiation, including ionizing radiation (i.e., alpha and gamma rays), can be sensed. The same general communication protocol can be used to communicate such information between RMS 150 and destination tag 110, via intermediate tags” (Lareau, [0046]). As would be clear to a POSITA, the request for communication by the RMS constitutes a controller polling a sensor, whereby data corresponding to an indicator can then be transmitted to the RMS. Furthermore, Lareau discloses that the method “polls each of the tags in the network to find out the environmental conditions in which their assets are experiencing” (Lareau, [0107]). Additionally, Lareau describes “[o]nce the RMS has been triggered to poll the network (step 604), the network may be polled (step 630)… in brief, any environmental parameter exceedances, as well as location coordinate information may be requested of each tag in the network. The RMS then receives responses conveying this information from the tags in the network” (Lareau, [0099]). The disclosures of Lareau clearly discuss a controller polling a sensor for reading the indicator for communicating back to the controller.

898. Thus, for at least the reasons detailed above, Lareau satisfies all limitations added to claim 1 by claim 20 of the ’887 Patent.

v.Claim 21

899. Claim 21 of the ’887 Patent recites:

> The wireless automation device of claim 20 where the controller is configured to operate the transceiver to communicate information associated reading of the indicator during the current period of the transmission interval.

900. Claim 21 of the ’887 Patent depends upon claim 20, and places additional limitations on information communicated by the controller operating the transceiver. In particular, the controller operates the transceiver to communicate information associate with a reading of an indicator during the current period of the transmission interval. For at least the reasons below, it is my opinion that each and every limitation added to claim 20 of the ’887 Patent by claim 21 is also disclosed, anticipated, or rendered obvious by Lareau.

901. Lareau discloses “[t]he wireless ID tag includes a portable power supply and a transceiver configured to wirelessly communicate with other ID tags within a predetermined proximity” (Lareau, [0011]). Additionally, Lareau describes “[o]nce the RMS has been triggered to poll the network (step 604), the network may be polled (step 630)… in brief, any environmental parameter exceedances, as well as location coordinate information may be requested of each tag in the network. The RMS then receives responses conveying this information from the tags in the network” (Lareau, [0099]). Lareau clearly discloses a controller operating a transceiver to communicate information, where that information includes environmental parameter exceedances, determined by sensor readings, including during the current period of the transmission interval, as required by claim 21.

902. Thus, for at least the reasons detailed above, Lareau satisfies all limitations added to claim 20 by claim 21 of the ’887 Patent.

F. Claims 1, 11, 12, 20, and 21 of the ’887 Patent are obvious to a POSITA in view of Kates in combination with Lareau

i. Motivation to combine Kates with Lareau

903. It is my opinion that a POSITA looking to the teachings of Kates would have additionally looked to the teachings of Lareau and been motivated to combine these prior art references for the reasons detailed below, and by doing so, would have arrived independently at a system that satisfies each and every limitation of asserted claims 1, 11, 12, 20, and 21 of the ’887 Patent.

904. As detailed in Section V, Kates and Lareau are both directed to a wireless network of devices containing a central base unit and a web of remote devices which provide sensing capabilities at distributed locations. Both Kates and Lareau provide a means for the transmission of sensor readings from each remote device to a base unit, as well as a means for the transmission of commands from the base unit to the remote device. Both patents provide a means for data storage in the base unit and the remote device, where the timing for various events, instructions for sensor readings, sensor measurement data, etc. can be stored and accessed. Both prior art references also allow for variable timing in the periodic transmission of data from the remote unit to the base unit. Thus, both Kates and Lareau are within the same field of endeavor and are addressing problems with similar approaches.

905. Both Kates and Lareau disclose the generation of an indicator for some sensed condition. Kates teaches that “[i]f an anomalous condition is detected, then the sensor unit ‘wakes up’ and begins communicating with the base unit or with a repeater” (Kates, [0007]). The types of conditions sensed by the system of Kates include “smoke, temperature, humidity, moisture, water, water temperature, carbon monoxide, natural gas, propane gas, other flammable gases, radon,

poison gasses, etc." [0007]. Here, Kates describes the measurement of a sensed condition and an indicator of anomalous measurements, which includes initializing communication with the base unit. Similarly, Lareau teaches that "temperature, air pressure, vibrations, humidity, and electromagnetic radiation, including ionizing radiation (i.e., alpha and gamma rays), can be sensed. The same general communication protocol can be used to communicate such information between RMS 150 and destination tag 110, via intermediate tags" (Lareau, [0046]). Lareau includes many of the same sensed conditions as disclosed in Kates, and the generated indicator similarly includes initializing communication with the base unit. Thus, both Kates and Lareau are directed to utilizing distributed wireless sensors for determining the same sensed conditions, to be communicated through similar means for addressing related problems.

906. Both Kates and Lareau disclose rewriting or changing some value or parameter associated with the remote unit by the base unit. Kates teaches that the base unit is able to "schedule different wakeup intervals to different sensor unit 102-106 based on the sensor unit's health, power status, etc." (Kates, [0047]). This variability in timing based on the situation allows for the base unit to monitor sensor data at periodic intervals that is "based on the type of data and urgency of the data collected by the sensor unit" (Kates, [0047]). Similarly, Lareau teaches that "[o]nce placed at a location, the tag coupled to the particular asset can be programmed with the location…[t]he coordinates (i.e., Cartesian, polar, or spherical) of the location can then be programmed into the memory of the tag" (Lareau, [0045]). The base unit of Lareau discloses changing a value on the remote unit in order to modify the location stored in the remote unit.

907. A POSITA would have been motivated to use the variable polling interval of Lareau to provide flexibility in the timing of sensor readings for the wireless sensor system of Kates. A POSITA would have understood the advantage of using a variable polling interval in a system that

included multiple types of sensors collecting different types of data with various levels of urgency. This embodiment a POSITA would have been motivated to make from the specific combination of the two prior art references would have had the advantage of a dynamically configurable timing range such that the utility of the wireless network components could be easily modified for various applications. For instance, a water flow sensor may benefit from more frequent polling than an indoor humidity sensor, and so the ability to program different polling intervals between different types of sensors allows for more precise monitoring of a variety of stimuli. Additionally, a temperature sensor which is experiencing a rapid increase in measured temperature may benefit from more frequent polling, and so the ability to modify the polling interval for the same sensor could provide more time-sensitive measurements.

908. A POSITA would have recognized that the disclosures of Kates and Lareau are compatible with each other and would be able to implement the above-described combination of features without undue experimentation to achieve predictable results. That is, altering the system of Kates to accommodate variable timing of sensor readings would have required only standard modifications on the part of a POSITA without any need for substantive design changes to the wireless network architecture or changes to the individual device hardware. A POSITA further would have had a reasonable expectation of success utilizing the teaching of Kates with minor input from Lareau regarding programmable scheduling of polling events and any modifications directed toward implementation would have been within the skill of a POSITA.

909. Thus, for reasons described above as well as those discussed in the claim-by-claim analysis below, it is my opinion that a POSITA have been motivated to combine Kates and Lareau to arrive at the specific combination of these prior art references detailed above.

ii.Claim 1

910. Claim 1 of the ’887 patent recites:

A wireless automation device, comprising:

a transceiver operable to wirelessly communicate packets of information over a wireless network;

a sensor operable to generate a indicator for a sensed condition;

a controller configured to poll the sensor at a polling interval to read the indicator during a current period of the polling interval and to selectively operate the transceiver to communicate information associated reading of the indicator; and

a memory, the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval,

wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a chance in the sensed condition within the predetermined range.

911. Thus, claim 1 of the ’887 patent is directed towards a wireless automation device, and includes limitations pertaining to the content and timing of bi-directional communication between a remote device and a base unit. For at least the reasons detailed below, each and every limitation of claim 1 of the ’887 patent is disclosed by the combination of Kates and Lareau, and, consequently, this claim is invalid as anticipated or obvious to a POSITA in view of the combination of Kates and Lareau.

a. **1[pre] A wireless automation device, comprising:**

912. To the extent that the preamble of claim 1 of the ’887 patent is limiting, Kates discloses a wireless automation device for at least the following reasons.

913. Kates discloses a wireless automation device, for example Kates describes "[a] low cost, robust, wireless sensor system that provides an extended period of operability without maintenance" (Kates, Abstract). Kates additionally discloses "[i]n one embodiment, the sensor unit is bi-directional and configured to receive instructions from the central reporting station (or repeater). Thus, for example, the central reporting station can instruct the sensor to: perform additional measurements, go to a standby mode, wake up; report battery status, change wake-up interval, run self-diagnostics and report results, etc." (Kates, [0008]). Kates discloses wireless sensor units that are designed to operate within the disclosed automation system (Kates, [0036], [0052], Fig. 2).

914. Thus, for at least the reasons detailed above, Kates discloses a wireless automation device as required by the preamble to claim 1 of the '887 patent.

b. **1[a] a transceiver operable to wirelessly communicate packets of information over a wireless network;**

915. Kates discloses a transceiver operable to wirelessly communicate packets of information over a wireless network, as required by claim element 1[a], for at least the following reasons.

916. As can be seen in Fig. 2 of Kates, reproduced here as Figure 45, the sensor unit 102 contains a transceiver 203 operatively connected to the controller 202. The transceiver 203 transmits wireless communications, and as disclosed by Kates "[t]he sensor unit 102 attaches its ID to outgoing communication packets so that transmissions from the sensor unit 102 can be identified by the repeater 110" (Kates, [0036]).

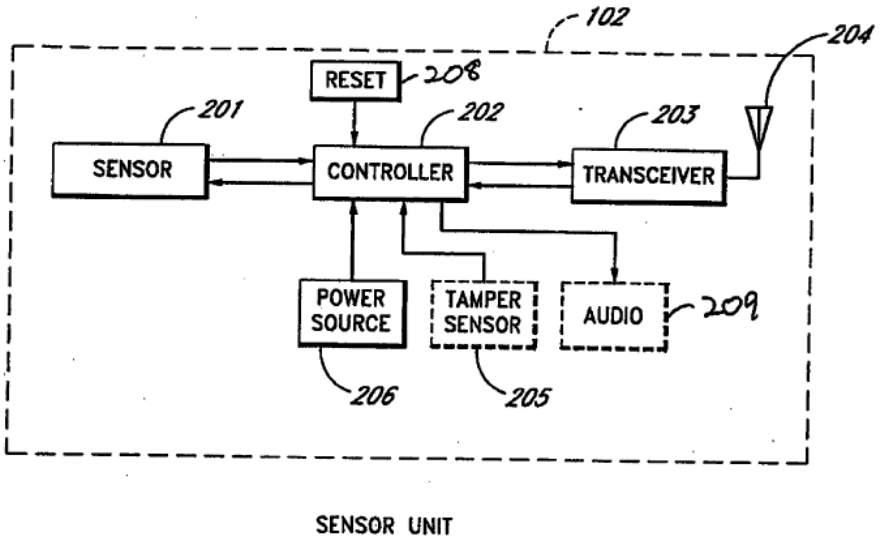


FIG. 2

Reproduction of Fig. 2 of Kates showing a block diagram for a sensor unit

917. Thus, for at least the reasons detailed above, Kates discloses a transceiver operable to wirelessly communicate packets of information over a wireless network as required by claim element 1[a] of the '887 Patent.

c. **1[b] a sensor operable to generate a indicator for a sensed condition;**

918. Kates discloses a sensor operable to generate an indicator for a sensed condition, as required by claim element 1[b], for at least the following reasons.

919. Kates discloses a sensor system which "includes a battery-operated sensor unit that detects a condition, such as, for example, smoke, temperature, humidity, moisture, water, water temperature, carbon monoxide, natural gas, propane gas, other flammable gases, radon, poison gasses, etc." and that "[i]f an anomalous condition is detected, then the sensor unit 'wakes up' and begins communicating with the base unit or with a repeater" (Kates, [0007]). The one or more sensors is also shown as Sensor 201 in Figure 2 of Kates, below.

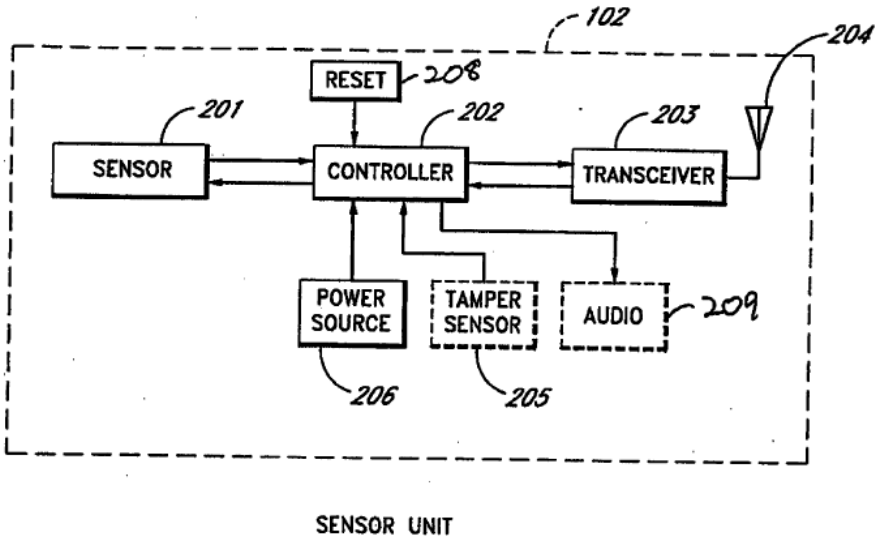


FIG. 2

Reproduction of Fig. 2 of Kates

920. The conditions described above (e.g., smoke, temperature, etc.) constitute the required "sensed condition" and the sensor unit waking up to communicate with the base unit or repeater fulfills the "indicator" required by claim element 1[b].

921. Thus, for at least the reasons detailed above, Kates discloses a sensor operable to generate an indicator for a sensed condition as required by claim element 1[b] of the '887 Patent.

d. **1[c] a controller configured to poll the sensor at a polling interval to read the indicator during a current period of the polling interval and to selectively operate the transceiver to communicate information associated reading of the indicator; and**

922. Kates discloses a controller configured to poll the sensor at a polling interval to read the indicator during a current period of the polling interval and to selectively operate the transceiver to communicate information associated with the reading of the indicator, as required by claim element 1[c], for at least the following reasons.

923. Kates discloses a sensor system where "the sensor unit provides two wake-up modes, a first wake-up mode for taking measurements (and reporting such measurements if deemed necessary), and a second wake-up mode for listening for commands from the central reporting station. The two wake-up modes, or combinations thereof, can occur at different intervals" (Kates, [0009]). As would be understood by a POSITA, the second wake-up mode of Kates allows for the controller to poll the sensor unit by sending a command to the sensor unit. This is further exemplified by the disclosure of Kates whereby

> the repeater is configured to provide bi-directional communication between one or more sensors and a base unit. In one embodiment, the repeater is configured to receive instructions from the central reporting station (or repeater). Thus, for example, the central reporting station can instruct the repeater to: send commands to one or more sensors; go to standby mode; 'wake up'; report battery status; change wake-up interval; run self-diagnostics and report results; etc. (Kates, [0012]).

924. The above disclosure of Kates illustrates a controller which can communicate to remote sensor units through a repeater in order to poll the sensor units for e.g., reporting results. As the disclosure of Kates centers on a wireless sensor system, a POSITA would understand that the communication would necessarily occur through one or more transceivers, as required by claim 1[c].

925. The sensor unit also "takes regular sensor readings and evaluates the readings to determine if an anomalous condition exists" (Kates, [0007], [0033]). The sensor unit contains a controller shown as Controller 202 in Figure 2 (Kates, [0050]-[0052], [0063]-[0064]). The controller controls the operations of the sensor unit, including "provid[ing] power, data, and control information to the sensor(s) 201 and the transceiver 202," "receiv[ing] sensor data from the sensor(s) 201," converting analog sensor data into a digital format, and "evaluat[ing] the sensor data by comparing the data value to a threshold value (e.g., a high threshold, a low threshold, or a high-low threshold)"

(Kates, [0052]). The sensor unit may take readings "at periodic intervals," which a POSITA would understand as being performed by the controller polling the sensor at intervals to obtain a reading. (Kates, [0033], Figs. 6, 7). Further, Kates discloses that controller evaluates the obtained sensor data, compares the data to a pre-programmed threshold, and operates the transceiver such that "[i]f the data is outside the threshold (e.g., above a high threshold, below a low threshold, outside an inner range threshold, or inside an outer range threshold), then the data is deemed to be anomalous and is transmitted to the base unit 112" (Kates, [0052]). Thus, a POSITA would understand that the controller controls the processes of the sensor unit, including the taking of regular sensor readings, performing the self-diagnostic and reporting the results to the base unit, and controlling the transceiver to selectively transmit information associated with the reading of the indicator.

926. Thus, for at least the reasons detailed above, Kates discloses a controller configured to poll the sensor at a polling interval to read the indicator during a current period of the polling interval and to selectively operate the transceiver to communicate information associated with the reading of the indicator as required by claim element 1[c] of the '887 Patent.

e. **1[d] a memory, the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval,**

927. Kates discloses a memory, the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval, as required by claim element 1[d], for at least the following reasons.

928. Kates discloses that the sensor unit contains a controller shown as Controller 202 in Figure 2 (Kates, [0050]-[0052], [0063]-[0064]). The controller controls the operations of the sensor unit, including "provid[ing] power, data, and control information to the sensor(s) 201 and the

transceiver 202," "receiv[ing] sensor data from the sensor(s) 201," converting analog sensor data into a digital format, and "evaluat[ing] the sensor data by comparing the data value to a threshold value (e.g., a high threshold, a low threshold, or a high-low threshold)" (*Id*.). Kates discloses that "[i]n one embodiment, the data threshold is programmed into the controller 202" (Kates, [0052]). Kates further explains that "[i]n one embodiment, the controller 202 is a conventional programmable microcontroller. In one embodiment, the controller 202 is based on a Field Programmable Gate Array (FPGA), such as, for example, provided by Xilinx Corp." (Kates, [0051]). FPGAs manufactured by Xilinx did include memory in communication with the processor. For example, the Virtex-5 FPGA[11], available by Xilinx in 2008, has enhanced 36 kbit Block RAM and an option for commodity flash memory. The Virtex-4 FPGA, also available by Xilinx in 2006, has up to 10Mbits Block RAM.[12] Further, a POSITA would have known that sensor unit must contain memory (either as part of Controller 202 or as a separate component) in order for the sensor unit to operate as described. In particular, in order for the sensor unit to store the pre-programmed thresholds as described, and in order for the sensor unit to compare the sensor readings to such thresholds as described, a POSITA would have understood that a memory must exist within the sensor unit that stores sensor readings. Further, a POSITA would have understood, in view of the operations disclosed in Kates, that such memory would store at least one prior sensor reading, where the memory stores at least one prior reading of the indicator, including in view of the comparisons and "periodic monitoring" and transmissions disclosed in Kates. At the very least, it would have been obvious to a POSITA to store such information in the sensor unit to carry out the disclosed functions, including in view of the energy savings goals described in Kates.

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[11] *See* Virtex-5 product page by Xilinx Corporation, dated March 12, 2008, accessed April 19, 2023. Virtex-5 Multi-Platform FPGA (archive.org); ecobee-Ollnova-000091580-581.

[12] *See* https://web.archive.org/web/20060311094736/, dated March 11, 2006, last accessed April 23, 2023.

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929. Thus, for at least the reasons detailed above, Kates discloses a memory, the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval as required by claim element 1[d] of the ’887 Patent.

f. **1[e] wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a chance in the sensed condition within the predetermined range.**

930. Kates discloses a wireless automation device wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a change in the sensed condition within the predetermined range, as required by claim element 1[e].

931. Kates discloses

> using sensors that require relatively little power, while in the low power mode the sensor unit 102 takes regular sensor readings and evaluates the readings to determine if an anomalous condition exists. In one embodiment, using sensors that require relatively more power, while in the low power mode the sensor unit 102 takes and evaluates sensor readings at periodic intervals. If an anomalous condition is detected, then the sensor unit 102 ‘wakes up’ and begins communicating with the base unit 112 through the repeater 110 (Kates, [0033]).

932. In the above description by Kates, the sensor unit will periodically wake up and begin communicating with the base unit when an “anomalous condition” is detected, which corresponds

to the required transmission of a most recent reading in response to a change in the sensed condition outside of the predetermined range. On the other hand, Kates discloses that "[t]he sensor unit 102 generally conserves power by not transmitting data that falls within a normal range" and "[i]f the data is outside the threshold (e.g., above a high threshold, below a low threshold, outside an inner range threshold, or inside an outer range threshold), then the data is deemed to be anomalous and is transmitted to the base unit 112" (Kates, [0052] ; see also Kates, Abstract; [0005]-[0007]; [0032]; [0033]; [0079]; claim 1). As a method of saving power, data that would otherwise be transmitted during a transmission event is not transmitted by the sensor unit 102 unless an anomalous condition (i.e., data outside of predetermined thresholds) occurs, constituting a suspension of transmission, as required by claim element 1[e]. In other words, a transmission that would otherwise occur is stopped upon determination that the sensor data is within a pre-programmed threshold.

933. Thus, for at least the reasons detailed above, Kates discloses a wireless automation device wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a change in the sensed condition within the predetermined range, as required by claim element 1[e] of the '887 Patent.

iii.Claim 11

934. Claim 11 of the '887 Patent recites:

> The wireless automation device of claim 1 where the transmission interval is variable.

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935. Claim 11 of the ’887 Patent depends upon claim 1, and places additional limitations pertaining to the data transmission interval. In particular, claim 11 requires that the transmission interval from the sensor unit is variable. For at least the reasons below, it is my opinion that each and every limitation added to claim 1 of the ’887 Patent by claim 11 is also disclosed, anticipated, or rendered obvious by Kates.

936. Kates discloses that “the base unit 112 can instruct the repeater to: send commands to one or more sensors; go to standby mode; ‘wake up’; report battery status; *change wake-up interval*; run self-diagnostics and report results; etc.” (Kates, [0045] *emphasis added*). The modification of the wake-up interval corresponds to a variable transmission interval as required by claim 11, where “[a]t programmed intervals, the sensor unit 102 also ‘wakes up’ and sends status information (e.g., power levels, self[-]diagnostic information, etc.) to the base unit (or repeater)” (Kates, [0033]). As a result, Kates discloses a variable transmission interval as required by claim 11.

937. Thus, for at least the reasons detailed above, Kates satisfies all limitations added to claim 1 by claim 11 of the ’887 Patent.

iv.Claim 12

938. Claim 12 of the ’887 Patent recites:

> The wireless automation device of claim 11, where the polling interval is variable.

939. Claim 12 of the ’887 Patent depends upon claim 11, and places additional limitations on the timing of the polling interval. In particular, claim 12 requires that the length of time between polls from the base unit to the sensor unit is variable. For at least the reasons below, it is my opinion that each and every limitation added to claim 11 of the ’887 Patent by claim 12 is also anticipated or rendered obvious by the combination of Kates and Lareau.

940. Kates discloses "[i]n one embodiment, the sensor unit provides two wake-up modes, a first wake-up mode for taking measurements (and reporting such measurements if deemed necessary), and a second wake-up mode for listening for commands from the central reporting station. The two wake-up modes, or combinations thereof, can occur at different intervals" (Kates, [0009]). As a POSITA would understand, the variable interval of the two wake-up modes, and combinations thereof, corresponds to a variable polling interval. The sensor unit can be polled during the "second wake-up mode" during which commands, including requests for measurement or other data, can be received and followed by the sensor unit.

941. However, even to the extent it is determined that Kates would not have rendered obvious to a POSITA a variable polling interval as required by claim 12, this limitation is disclosed by Lareau.

942. Lareau discloses "the RMS can send out the polling signals to the network of tags over an extended period of time in a pseudo-random fashion" (Lareau, [0108]). Given that the period of time between polling events is not fixed, the disclosure of Lareau inherently supports a variable polling interval, as required by claim 12. Additionally, Lareau discloses a method of polling that is used to reform the network of tags, whereby "[p]eriodically, the RMS 150 may reform the network of tags. The method in which the RMS 150 can accomplish this is described in further detail in FIG. 8. In short, the RMS 150 sends out repetitive broadcast signals and waits for replies to come back. Once all of the replies are from tags already having replied, the RMS 150 is aware of the tags in the surrounding network" and "[t]he periodicity of reforming the network may vary according to the asset traffic within the facility 70" (Lareau, [0041, 0042]). Furthermore, Lareau discloses that "each tag in the network may be polled to see if any preprogrammed sensor

thresholds have been exceeded since the last poll" (Lareau, [0050]). The preceding examples clearly demonstrate the variability of the polling interval in the disclosure of Lareau.

943. Thus, for at least the reasons detailed above, the limitations of added to claim 11 by claim 12 of the '887 Patent are satisfied by the specific combination of Kates and Lareau that a POSITA would be motivated to make.

v.Claim 20

944. Claim 20 of the '887 Patent recites:

> The wireless automation device of claim 1 where the controller is configured to poll the sensor during a period of the transmission interval to read the indicator during a current period of the transmission interval.

945. Claim 20 of the '887 Patent depends upon claim 1, and places additional limitations on when the sensor is polled and what is done during the polling. In particular, the controller will poll the sensor to read the indicator during that same period of the transmission interval. For at least the reasons below, it is my opinion that each and every limitation added to claim 1 of the '887 Patent by claim 20 is also disclosed, anticipated, or rendered obvious by the combination of Kates and Lareau.

946. Kates discloses "[i]n one embodiment, the sensor unit 102 provides two wake-up modes, a first wake-up mode for taking measurements (and reporting such measurements if deemed necessary), and a second wake-up mode for listening for commands from the central reporting station. The two wake-up modes, or combinations thereof, can occur at different intervals" (Kates, [0035]). This is further exemplified by the disclosure of Kates whereby

> the repeater is configured to provide bi-directional communication between one or more sensors and a base unit. In one embodiment, the repeater is configured to receive instructions from the central reporting station (or repeater). Thus, for example, the central reporting station can instruct the repeater to: send commands to one or more sensors; go to

> standby mode; 'wake up'; report battery status; change wake-up interval; run self-diagnostics and report results; etc. (Kates, [0012]).

947. The above disclosure of Kates illustrates a controller which can communicate to remote sensor units through a repeater in order to poll the sensor units for e.g., reporting results. As the disclosure of Kates centers on a wireless sensor system, a POSITA would understand that the communication would necessarily occur through one or more transceivers, as required by claim 1[c].

948. The sensor unit also "takes regular sensor readings and evaluates the readings to determine if an anomalous condition exists" (Kates, [0007], [0033]). The sensor unit contains a controller shown as Controller 202 in Figure 2 (Kates, [0050]-[0052], [0063]-[0064]). The controller controls the operations of the sensor unit, including "provid[ing] power, data, and control information to the sensor(s) 201 and the transceiver 202," "receiv[ing] sensor data from the sensor(s) 201," converting analog sensor data into a digital format, and "evaluat[ing] the sensor data by comparing the data value to a threshold value (e.g., a high threshold, a low threshold, or a high-low threshold)" (Kates, [0052]). The sensor unit may take readings "at periodic intervals," which a POSITA would understand as being performed by the controller polling the sensor at intervals to obtain a reading. (Kates, [0033], Figs. 6, 7). Further, Kates discloses that controller evaluates the obtained sensor data, compares the data to a pre-programmed threshold, and operates the transceiver such that "[i]f the data is outside the threshold (e.g., above a high threshold, below a low threshold, outside an inner range threshold, or inside an outer range threshold), then the data is deemed to be anomalous and is transmitted to the base unit 112" (Kates, [0052]). As described above, the controller controls the operations of the sensor unit, including the sensors (including polling of the sensors to read and indicator) and the transceiver (Kates, [0052]).

949. Lareau states that "temperature, air pressure, vibrations, humidity, and electromagnetic radiation, including ionizing radiation (i.e., alpha and gamma rays), can be sensed. The same general communication protocol can be used to communicate such information between RMS 150 and destination tag 110, via intermediate tags" (Lareau, [0046]). As would be clear to a POSITA, the request for communication by the RMS constitutes a controller polling a sensor, whereby data corresponding to an indicator can then be transmitted to the RMS. Furthermore, Lareau discloses that the method "polls each of the tags in the network to find out the environmental conditions in which their assets are experiencing" (Lareau, [0107]). Additionally, Lareau describes "[o]nce the RMS has been triggered to poll the network (step 604), the network may be polled (step 630)… in brief, any environmental parameter exceedances, as well as location coordinate information may be requested of each tag in the network. The RMS then receives responses conveying this information from the tags in the network" (Lareau, [0099]). The disclosures of Lareau clearly discuss a controller polling a sensor for reading the indicator for communicating back to the controller.

950. Thus, for at least the reasons detailed above, the combination of Kates and Lareau satisfies all limitations added to claim 1 by claim 20 of the '887 Patent.

vi.Claim 21

951. Claim 21 of the '887 Patent recites:

> The wireless automation device of claim 20 where the controller is configured to operate the transceiver to communicate information associated reading of the indicator during the current period of the transmission interval.

952. Claim 21 of the '887 Patent depends upon claim 20, and places additional limitations on information communicated by the controller operating the transceiver. In particular, the controller operates the transceiver to communicate information associate with a reading of an indicator

during the current period of the transmission interval. For at least the reasons below, it is my opinion that the limitation added to claim 20 of the '887 Patent by claim 21 is also disclosed, anticipated, or rendered obvious by the combination of Kates and Lareau.

953. Kates discloses "[i]n one embodiment, the sensor unit 102 provides two wake-up modes, a first wake-up mode for taking measurements (and reporting such measurements if deemed necessary), and a second wake-up mode for listening for commands from the central reporting station. The two wake-up modes, or combinations thereof, can occur at different intervals" (Kates, [0035]). Furthermore, Kates also describes that "the base unit 112 can instruct the sensor unit 102 to perform additional measurements, to go to a standby mode, to wake up, to report battery status, to change wake-up interval, to run self-diagnostics and report results, etc." (Kates, [0034]). As described in the above disclosures by Kates, the sensor unit reports the result of reading the indicator to the base unit (i.e., report results). The controller controls the operations of the sensor unit, including the sensors and the transceiver (Kates, [0052]). Additionally, a POSITA would understand that a transceiver is used to wirelessly communicate this information from a sensor unit to a transceiver associated with the base unit (*see* e.g., transceiver 203 of the sensor unit and transceiver 402 of the base unit).

954. Lareau discloses "[t]he wireless ID tag includes a portable power supply and a transceiver configured to wirelessly communicate with other ID tags within a predetermined proximity" (Lareau, [0011]). Additionally, Lareau describes "[o]nce the RMS has been triggered to poll the network (step 604), the network may be polled (step 630) … in brief, any environmental parameter exceedances, as well as location coordinate information may be requested of each tag in the network. The RMS then receives responses conveying this information from the tags in the network" (Lareau, [0099]). Lareau clearly discloses a controller operating a transceiver to

communicate information, where that information includes environmental parameter exceedances, determined by sensor readings, including during the current period of the transmission interval, as required by claim 21.

955. Thus, for at least the reasons detailed above, Lareau satisfies all limitations added to claim 20 by claim 21 of the ’887 Patent.

G. Claims 1, 11, 12, 20, and 21 of the ’887 Patent are obvious to a POSITA in view of Helgeson in combination with Lareau

i. Motivation to combine Helgeson with Lareau

956. It is my opinion that a POSITA looking to the teachings of Helgeson would have additionally looked to the teachings of Lareau and been motivated to combine these prior art references for the reasons detailed below, and by doing so, would have arrived independently at a system that satisfies each and every limitation of asserted claims 1, 11, 12, 20, and 21 of the ’887 Patent.

957. As detailed in Section V, Helgeson and Lareau are both directed to a wireless network of devices containing a central base unit and a web of remote devices which provide sensing capabilities at distributed locations. Both Helgeson and Lareau provide a means for the transmission of sensor readings from each remote device to a base unit, as well as a means for the transmission of commands from the base unit to the remote device. Both patents provide a means for data storage in the base unit and the remote device, where the timing for various events, instructions for sensor readings, sensor measurement data, etc. can be stored and accessed. Both prior art references also allow for variable timing in the periodic transmission of data from the remote unit to the base unit. Thus, both Helgeson and Lareau are within the same field of endeavor and are addressing problems with similar approaches.

958. Both Helgeson and Lareau disclose the generation of an indicator for some sensed condition. Helgeson teaches that "remote units can be configured or programmed to transmit sensor data only on a timeout occurrence or on a change occurrence. For example, a temperature sensor may be configured to transmit every half-hour or upon a one (1) degree change from last transmission" (Helgeson, [0032]). In this instance, Helgeson describes as the sensed condition a specified threshold change in temperature, where the generated indicator includes initializing communication with the base unit. Similarly, Lareau teaches that "temperature, air pressure, vibrations, humidity, and electromagnetic radiation, including ionizing radiation (i.e., alpha and gamma rays), can be sensed. The same general communication protocol can be used to communicate such information between RMS 150 and destination tag 110, via intermediate tags" (Lareau, [0046]). Lareau includes many of the same sensed conditions as disclosed in Helgeson, and the generated indicator similarly includes initializing communication with the base unit. Thus, both Helgeson and Lareau are directed to utilizing remotely located wireless sensors for determining the same sensed conditions, to be communicated through similar means for addressing related problems.

959. Both Helgeson and Lareau disclose rewriting or changing some value or parameter associated with the remote unit by the base unit. Helgeson teaches that "[u]pon receiving an ARM message 203, an ARMING state 204 is entered during which the security device can be armed" and "when a DISARM message 207 is received by the remote unit, a DISARMING state 208 is entered and the device disarmed." (Helgeson, [0047]). This sequence of Helgeson shows a command from the base unit sent to the remote unit, whereby the state of the remote unit is modified. Similarly, Lareau teaches that "[o]nce placed at a location, the tag coupled to the particular asset can be programmed with the location…[t]he coordinates (i.e., Cartesian, polar, or

spherical) of the location can then be programmed into the memory of the tag" (Lareau, [0045]). The base unit of Lareau discloses changing a value on the remote unit in order to modify the location stored in the remote unit.

960. A POSITA would have been motivated to use the variable polling interval of Lareau to provide flexibility in the timing of sensor readings for the wireless sensor system of Helgeson. A POSITA would have understood the advantage of using a variable polling interval in a system that included multiple types of sensors collecting different types of data with various levels of urgency. This embodiment a POSITA would have been motivated to make from the specific combination of the two prior art references would have had the advantage of a dynamically configurable timing range such that the utility of the wireless network components could be easily modified for various applications. For instance, a water flow sensor may benefit from more frequent polling than an indoor humidity sensor, and so the ability to program different polling intervals between different types of sensors allows for more precise monitoring of a variety of stimuli. Additionally, a temperature sensor that is experiencing a rapid increase in measured temperature may benefit from more frequent polling, and so the ability to modify the polling interval for the same sensor could provide more time-sensitive measurements.

961. A POSITA would have recognized that the disclosures of Helgeson and Lareau are compatible with each other and would be able to implement the above-described combination of features without undue experimentation to achieve predictable results. That is, altering the system of Helgeson to accommodate variable timing of sensor readings would have required only standard modifications on the part of a POSITA without any need for substantive design changes to the wireless network architecture or changes to the individual device hardware. A POSITA further would have had a reasonable expectation of success utilizing the teaching of Helgeson with minor

input from Lareau regarding programmable scheduling of polling events and any modifications directed toward implementation would have been within the skill of a POSITA.

962. Thus, for reasons described above as well as those discussed in the claim-by-claim analysis below, it is my opinion that a POSITA have been motivated to combine Helgeson and Lareau to arrive at the specific combination of these prior art references detailed above.

ii.Claim 1

963. Claim 1 of the ’887 Patent recites:

> A wireless automation device, comprising:
>
> a transceiver operable to wirelessly communicate packets of information over a wireless network;
>
> a sensor operable to generate a indicator for a sensed condition;
>
> a controller configured to poll the sensor at a polling interval to read the indicator during a current period of the polling interval and to selectively operate the transceiver to communicate information associated reading of the indicator; and
>
> a memory, the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval,
>
> wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a chance in the sensed condition within the predetermined range.

964. Thus, claim 1 of the ’887 patent is directed towards a wireless automation device and includes limitations pertaining to the content and timing of bi-directional communication between a remote device and a base unit. For at least the reasons detailed below, each and every limitation

of claim 1 of the ’887 patent is disclosed by the combination of Helgeson and Lareau, and, consequently, it is my opinion that this claim is invalid as anticipated or obvious to a POSITA in view of the combination of Helgeson and Lareau.

a. **1[pre] A wireless automation device, comprising:**

965. To the extent that the preamble of claim 1 of the ’887 Patent is limiting, Helgeson discloses a wireless automation device for at least the following reasons.

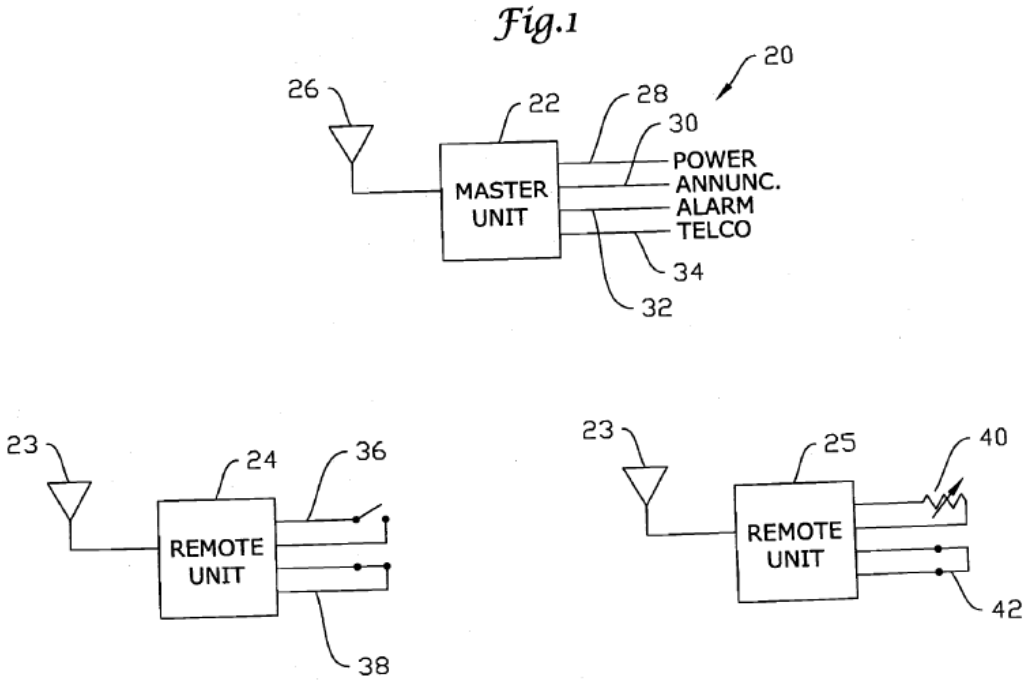
966. Helgeson discloses a wireless automation device. For example Helgeson describes a “[b]uilding monitoring and control systems including bi-directional radio frequency links between master and remote units” (Helgeson, Abstract). Helgeson describes, in Figure 1, “a wireless control system 20 including a master unit 22 and two wireless remote units 24 and 25.” (Helgeson, [0023]). The master and remote units contain programming such that the devices perform functions automatically within an automation system (*see* Helgeson, [0008], [0026], [0028]-[0030], [0032], [0052]). A POSITA would understand that the mater and remote units are wireless automation devices.

967. Thus, for at least the reasons detailed above, Helgeson discloses a wireless automation device as required by the preamble to claim 1 of the ’887 Patent.

b. **1[a] a transceiver operable to wirelessly communicate packets of information over a wireless network;**

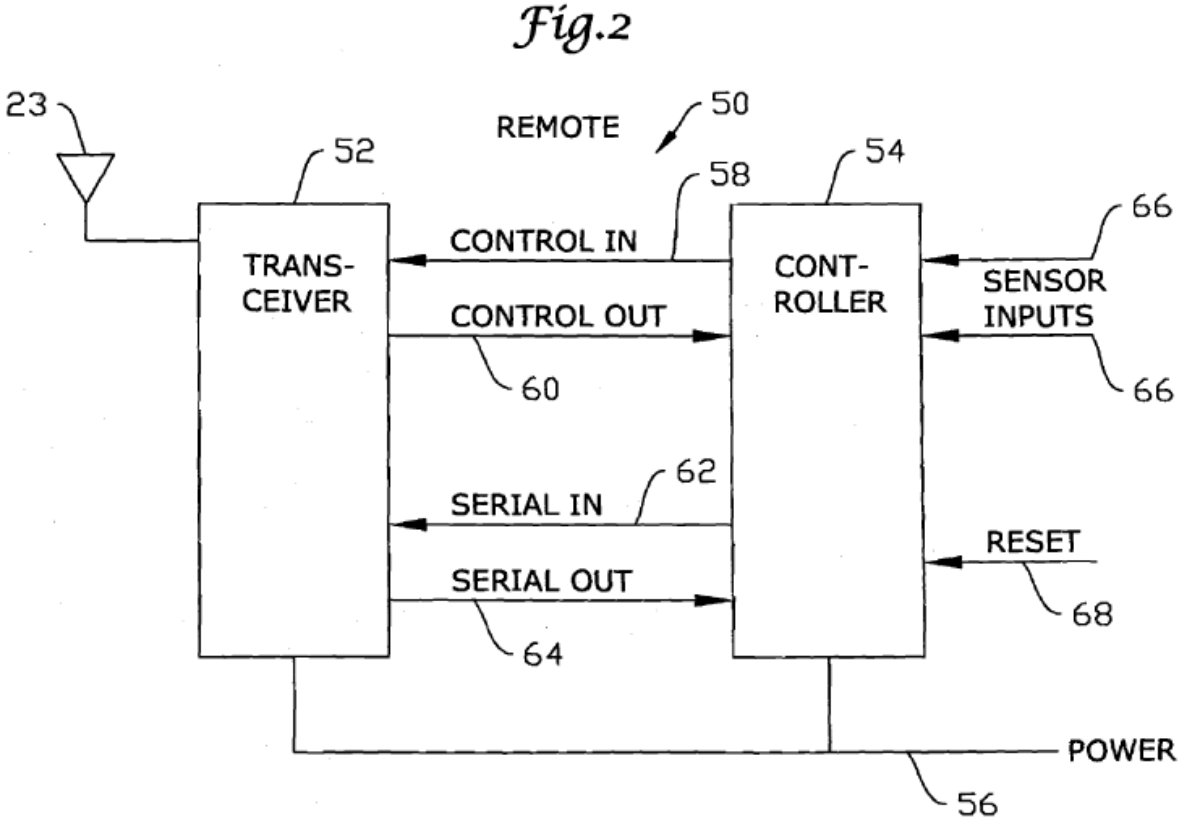
968. Helgeson discloses a transceiver operable to wirelessly communicate packets of information over a wireless network, as required by claim element 1[a], for at least the following reasons.

969. As can be seen in Fig. 1 of Helgeson, reproduced here as , master and remote units contain antennas (23, 26) for wireless communications (Helgeson, Fig. 1, [0023], [0026]).



Reproduction of Fig. 1 of Helgeson

970. Further, as can be seen in Fig. 2 of Helgeson, a transceiver 52 is operatively connected to a controller 54 and an antenna 23 for wireless communications.



Reproduction of Fig. 2 of Helgeson showing a block diagram for a sensor unit

971. Additionally, Helgeson discloses functionality of the transceiver, wherein "[t]ransceiver 52, in one embodiment, can be set to transmit and receive on different frequencies and to rapidly switch between frequencies" (Helgeson, [0026]). As a POSITA would understand, the transceiver 52 wirelessly communicates packets of information over a wireless network as required by claim element 1[a].

972. Thus, for at least the reasons detailed above, Helgeson discloses a transceiver operable to wirelessly communicate packets of information over a wireless network as required by claim element 1[a] of the '887 Patent.

c. **1[b] a sensor operable to generate a indicator for a sensed condition;**

973. Helgeson discloses a sensor operable to generate an indicator for a sensed condition, as required by claim element 1[b], for at least the following reasons.

974. Helgeson discloses that "[t]he system can include at least one master unit and a plurality of remote units, the remote units being typically coupled to sensors for measuring and/or controlling security or building environment variables" (Helgeson, [0011]). Helgeson explains that "[s]ensors can also be used to measure analog or continuously variable properties of a building environment such as temperature, humidity, airflow, and hot water flow" (Helgeson, [0013]; *see* also Helgeson, [0023], [0024]). In Fig. 2, Helgeson discloses "sensor inputs" 66 to controller 54. (Helgeson, [0028], Fig. 2). Helgeson discloses that "remote units can be configured or programmed to transmit sensor data only on a timeout occurrence or on a change occurrence. For example, a temperature sensor may be configured to transmit every half-hour or upon a one (1) degree change from last transmission" (Helgeson, [0032]). In this example, the transmission of data occurs when a temperature sensor senses a one-degree change in temperature, where the transmission of data constitutes the indicator and the one-degree change in temperature is the sensed condition, as required by claim element 1[b].

975. Thus, for at least the reasons detailed above, Helgeson discloses a sensor operable to generate an indicator for a sensed condition as required by claim element 1[b] of the '887 Patent.

d. **1[c] a controller configured to poll the sensor at a polling interval to read the indicator during a current period of the polling interval and to selectively operate the transceiver to communicate information associated reading of the indicator; and**

976. Helgeson discloses a controller configured to poll the sensor at a polling interval to read the indicator during a current period of the polling interval and to selectively operate the

transceiver to communicate information associated with the reading of the indicator, as required by claim element 1[c], for at least the following reasons.

977. Helgeson states that "[c]ontroller 54 includes a programmable microprocessor such as the PIC microprocessor in one embodiment," and "[i]n the embodiment illustrated, controller 54 is coupled to transceiver 52 with control input line 58, control output line 60, serial input line 62, and serial output line 64." (Helgeson, [0026]). Helgeson further explains that "[c]ontrol input line 58 can be used to reset the transceiver, to set modes, and to set transmit and receive frequencies," and "[c]ontrol output line 60 can be used by signal controller 54 to determine when communication receptions or transmissions have been completed" (Helgeson, [0027]). Helgeson further explains that "[s]erial input line 62 can be used to feed messages to be transmitted to transceiver 52 as well as frequencies to be used and other control parameters," and "[s]erial output line 64 can be used to provide messages received from transceiver 52 to controller 54 and can be used to convey information about signal strength to controller 54" (Helgeson, [0027]). Helgeson further discloses that the controller receives sensor data from sensor input lines 66 (Helgeson, [0028]). Thus, a POSITA would understand that the controller controls the processes of the remote unit, including the taking of regular sensor readings, and reporting the results to the master unit, and controlling the transceiver to selectively transmit information associated with the reading of the indicator.

978. Helgeson discloses "[i]n a preferred embodiment, at least three events can awaken the transceiver from the sleep mode … [a]nother event is the lapse of a preset time interval, such as the lapse of the time interval between scheduled health status transmissions by the remote, or between scheduled health status polls initiated by the master unit for which the remote desires to be awake" (Helgeson, [0031]). In this example, the "scheduled health status polls" of the remote

unit by the master unit constitute a "controller configured to poll the sensor at a polling interval." For example, in claim 20, Helgeson discloses the feature "the remote units are capable of transmitting to and receiving from the master unit of the building monitoring and control system and capable of generating polling events in response to a poll message received from the master unit." (Helgeson, claim 20; *see* also Helgeson, [0012], [0037]-[0038]). Furthermore, Helgeson additionally discloses "[i]n one method, a POLL REQUEST 117 is received from the master unit and the remote unit transitions to a TRANSMITTING HEALTH state 118" and "[i]n some embodiments, sensor data is included in the TRANSMITTING HEALTH transmission" (Helgeson, [0038, 0040]). The result of the above poll request is the transmission of at least sensor data, which corresponds to the "reading of the indicator" as required by claim element 1[c].

979. Thus, for at least the reasons detailed above, Helgeson discloses a controller configured to poll the sensor at a polling interval to read the indicator during a current period of the polling interval and to selectively operate the transceiver to communicate information associated with the reading of the indicator as required by claim element 1[c] of the '887 Patent.

e. **1[d] a memory, the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval,**

980. Helgeson discloses a memory, the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval, as required by claim element 1[d], for at least the following reasons.

981. Helgeson discloses multiple measurements which are compared to each other

> [i]n one example of the invention, a message is received from a remote unit indicating the opening of a window. The lookup table for that type of device indicates that two readings are required and that the second

> reading should be taken in 0.5 seconds… The remote unit reads the window sensor again after 0.5 seconds and transmits the value to the master unit. The master unit can then report out that the window opened if both readings agree (Helgeson, [0051]).

982. As a POSITA would understand, a first measurement being taken and subsequently compared to a second measurement would necessarily require that at least the first measurement be stored in a memory, followed by the second measurement being stored in the memory for comparison. In this manner, the disclosure of Helgeson satisfies the requirements of claim element 1[d].

983. Helgeson also states that "[c]ontroller 54 includes a programmable microprocessor such as the PIC microprocessor in one embodiment," and "[i]n the embodiment illustrated, controller 54 is coupled to transceiver 52 with control input line 58, control output line 60, serial input line 62, and serial output line 64" (Helgeson, [0026]). Helgeson further explains that "[c]ontrol input line 58 can be used to reset the transceiver, to set modes, and to set transmit and receive frequencies," and "[c]ontrol output line 60 can be used by signal controller 54 to determine when communication receptions or transmissions have been completed" (Helgeson, [0027]). Helgeson further explains that "[s]erial input line 62 can be used to feed messages to be transmitted to transceiver 52 as well as frequencies to be used and other control parameters," and "[s]erial output line 64 can be used to provide messages received from transceiver 52 to controller 54 and can be used to convey information about signal strength to controller 54" (Helgeson, [0027]). Helgeson further discloses that the controller receives sensor data from sensor input lines 66 (Helgeson, [0028]). Further, a POSITA would have known that remote unit must contain memory (either as part of the controller or as a separate component) in order for the sensor unit to operate as described. In particular, in order for the sensor unit to store the pre-programmed thresholds as described, and in order for the sensor unit to receive and transmit sensor data periodically, or after

the occurrence of an event, or to conduct polling (including in response to an initiation by a master unit), a POSITA would have understood that a memory must exist within the remote unit that stores sensor readings. Further, a POSITA would have understood, in view of the operations disclosed in Helgeson, that such memory would store at least one prior sensor reading, where the memory stores at least one prior reading of the indicator, including in view of the comparisons and transmission at "periodic intervals" disclosed in Helgeson. At the very least, it would have been obvious to a POSITA to store such information in the remote unit to carry out the disclosed functions, including in view of the energy savings goals described in Helgeson.

984. Thus, for at least the reasons detailed above, Helgeson discloses the controller storing a reading of the indicator during the current period in the memory, where the memory stores at least one prior reading of the indicator, the prior reading of the indicator made during a prior period of the polling interval as required by claim element 1[d] of the '887 Patent.

f. **1[e] wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a chance in the sensed condition within the predetermined range.**

985. Helgeson discloses a wireless automation device wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a change in the sensed condition within the predetermined range, as required by claim element 1[e].

986. Helgeson discloses "[i]n a preferred embodiment, at least three events can awaken the transceiver from the sleep mode. One event is the occurrence of a sensor data change, such as a door switch opening, or a significant percentage change of an analog variable" (Helgeson, [0031]). Helgeson further discloses "[i]n one embodiment, remote units can be configured or programmed to transmit sensor data only on a timeout occurrence or on a change occurrence" (Helgeson, [0032]). For example, Helgeson explains that "a temperature sensor may be configured to transmit every half-hour or upon a one (1) degree change from the last transmission," which "can greatly reduce power consumption" (Helgeson, [0032]). As a POSITA would understand, the "significant percentage change of an analog variable" of Helgeson constitutes a required change in the sensed condition outside of a predetermined range, as required by claim element 1[e]. The data can then be transmitted "on a change occurrence," and therefore when a sensor data change occurs the data is transmitted. Helgeson discusses data transmission when there is a "significant percentage change of an analog variable," where a POSITA would understand that the significant percentage change represents a threshold, where data transmission that would otherwise occur is stopped when the change in the analog variable is below the threshold, but data transmission does happen when the change in the analog variable is above the threshold. In other words, in order to advance its energy-savings goals, Helgeson discloses that information may be transmitted only upon a determination that sensor data exceeds a pre-programmed threshold, where a transmission that would otherwise occur is stopped upon a determination that the sensor data is within a pre-programmed threshold.

987. Thus, for at least the reasons detailed above, Helgeson discloses a wireless automation device wherein the transceiver is configured to transmit a most recent reading of the indicator stored in the memory during a period of a transmission interval in response to detecting a change in the sensed condition outside a predetermined range and wherein transmission of the most recent

reading of the indicator stored in the memory during the period of the transmission interval is suspended in response to detecting a change in the sensed condition within the predetermined range, as required by claim element 1[e] of the ’887 Patent.

iii.Claim 11

988. Claim 11 of the ’887 Patent recites:

> The wireless automation device of claim 1 where the transmission interval is variable.

989. Claim 11 of the ’887 Patent depends upon claim 1, and places additional limitations pertaining to the data transmission interval. In particular, claim 11 requires that the transmission interval from the sensor unit is variable. For at least the reasons below, it is my opinion that the limitation added to claim 1 of the ’887 Patent by claim 11 is also disclosed, anticipated, or rendered obvious by Helgeson.

990. Helgeson discloses “[i]n a preferred embodiment, at least three events can awaken the transceiver from the sleep mode… Another event is the lapse of a preset time interval, such as the lapse of the time interval between scheduled health status transmissions by the remote” (Helgeson, [0031]). Additionally, Helgeson explains that “[i]n one embodiment, a time to wait until transmitting status information, such as 300 seconds, is received from the master unit during GETTING SLOT state 106. The time to wait can either be used directly or adjusted with a margin of error to insure that the remote unit is not sleeping when the time period has elapsed” (Helgeson, [0036]). In the above-disclosed examples from Helgeson, the transmission interval of data from the remote unit is varied based on instructions from the master unit, and so the transmission interval of the wireless automation device of Helgeson is variable, as required by claim 11.

991. Thus, for at least the reasons detailed above, Helgeson satisfies all limitations added to claim 1 by claim 11 of the ’887 Patent.

iv.Claim 12

992. Claim 12 of the ’887 Patent recites:

> The wireless automation device of claim 11, where the polling interval is variable.

993. Claim 12 of the ’887 Patent depends upon claim 11, and places additional limitations on the timing of the polling interval. In particular, claim 12 requires that the length of time between polls from the base unit to the sensor unit is variable. For at least the reasons below, it is my opinion that each and every limitation added to claim 11 of the ’887 Patent by claim 12 is also anticipated or rendered obvious by the combination of Helgeson and Lareau.

994. Helgeson discloses “[i]n one embodiment, a PIC microprocessor is implemented on the same chip as the transceiver using CMOS logic and the PIC microprocessor is user programmable in an interpreted BASIC or JAVA language” (Helgeson, [0028]). Helgeson further explains “[p]rogrammable input line 86 can be used for many purposes, including down loading control logic, inputting keyboard strokes, and inputting lines of BASIC or JAVA code to be interpreted and executed” (Helgeson, [0029]). A POSITA would understand that the ability of a user to program the microprocessor would allow for a modification of the length of the polling interval, as the functionality of the wireless automation device greatly depends on the time interval of data transmission. For example, various sensors with different sensing modalities would benefit from user-specified polling intervals, as not all sensor readings will change as rapidly as others, and not all sensor readings are as time-sensitive as others (e.g., a temperature sensor incorporated into an HVAC system may require less frequent polling than a carbon monoxide detector). To illustrate this point, Helgeson discloses “[i]n many embodiments of the present invention, the master controller or controllers may require additional programmable functionality relative to the functionality required on the remote units” (Helgeson, [0030]). Furthermore, Helgeson also

discloses that "[i]t is contemplated that the system mode can be changed on the fly, whereby the particular sensor may again be polled more often" (Helgeson, [0037]). Clearly, the disclosure of Helgeson includes discussion of a sensor being "polled more often," which constitutes a variable polling interval.

995. However, even to the extent it is determined that Helgeson would not have rendered obvious to a POSITA a variable polling interval as required by claim 12, this limitation is disclosed by Lareau.

996. Lareau discloses "the RMS can send out the polling signals to the network of tags over an extended period of time in a pseudo-random fashion" (Lareau, [0108]). Given that the period of time between polling events is not fixed, the disclosure of Lareau inherently supports a variable polling interval, as required by claim 12. Additionally, Lareau discloses a method of polling that is used to reform the network of tags, whereby "[p]eriodically, the RMS 150 may reform the network of tags. The method in which the RMS 150 can accomplish this is described in further detail in FIG. 8. In short, the RMS 150 sends out repetitive broadcast signals and waits for replies to come back. Once all of the replies are from tags already having replied, the RMS 150 is aware of the tags in the surrounding network" and "[t]he periodicity of reforming the network may vary according to the asset traffic within the facility 70" (Lareau, [0041, 0042]). Furthermore, Lareau discloses that "each tag in the network may be polled to see if any preprogrammed sensor thresholds have been exceeded since the last poll" (Lareau, [0050]). The preceding examples clearly demonstrate the variability of the polling interval in the disclosure of Lareau.

997. Thus, for at least the reasons detailed above, the limitations of added to claim 11 by claim 12 of the '887 Patent are satisfied by the specific combination of Helgeson and Lareau that a POSITA would be motivated to make.

v.Claim 20

998. Claim 20 of the ’887 Patent recites:

> The wireless automation device of claim 1 where the controller is configured to poll the sensor during a period of the transmission interval to read the indicator during a current period of the transmission interval.

999. Claim 20 of the ’887 Patent depends upon claim 1, and places additional limitations on when the sensor is polled and what is done during the polling. In particular, the controller will poll the sensor to read the indicator during that same period of the transmission interval. For at least the reasons below, it is my opinion that each and every limitation added to claim 1 of the ’887 Patent by claim 20 is also disclosed, anticipated, or rendered obvious by Helgeson.

1000. Helgeson discloses

> In one method, a POLL REQUEST 117 is received from the master unit and the remote unit transitions to a TRANSMITTING HEALTH state 118. While in the TRANSMITTING HEALTH state 118 or soon before, the remote unit transceiver can be put into a transmit state at the desired frequency. In one embodiment, the poll request includes the desired transmit frequency to use. (Helgeson, [0038]).

1001. As a POSITA would understand, the above disclosure from Helgeson includes descriptions of a controller configured to poll the sensor during a period of the transmission interval (i.e., the TRANSMITTING HEALTH state) to read the indicator.

1002. Thus, for at least the reasons detailed above, Helgeson satisfies all limitations added to claim 1 by claim 20 of the ’887 Patent.

vi.Claim 21

1003. Claim 21 of the ’887 Patent recites:

> The wireless automation device of claim 20 where the controller is configured to operate the transceiver to communicate information associated reading of the indicator during the current period of the transmission interval.

1004. Claim 21 of the ’887 Patent depends upon claim 20, and places additional limitations on information communicated by the controller operating the transceiver. In particular, the controller operates the transceiver to communicate information associate with a reading of an indicator during the current period of the transmission interval. For at least the reasons below, it is my opinion that each and every limitation added to claim 20 of the ’887 Patent by claim 21 is also disclosed, anticipated, or rendered obvious by Helgeson.

1005. Helgeson discloses “[i]n a preferred embodiment, at least three events can awaken the transceiver from the sleep mode. One event is the occurrence of a sensor data change, such as a door switch opening, or a significant percentage change of an analog variable” (Helgeson, [0031]). Furthermore, Helgeson discloses an embodiment where “the remote, not including timing circuitry, initializes in a normal power consumption mode, sleeps in a very low power consumption mode, which, when interrupted, executes in a normal power consumption mode while transmitting or receiving” (Helgeson, [0033]). As a POSITA would understand, the disclosures of Helgeson include a controller which operates the transceiver to wirelessly communicate information which is associated with a reading of the indicator (i.e., a sensor data change).

1006. Thus, for at least the reasons detailed above, Helgeson satisfies all limitations added to claim 20 by claim 21 of the ’887 Patent.

VIII. INVALIDITY OF US PATENT NO. 7,860,495 (“the ’495 Patent”)

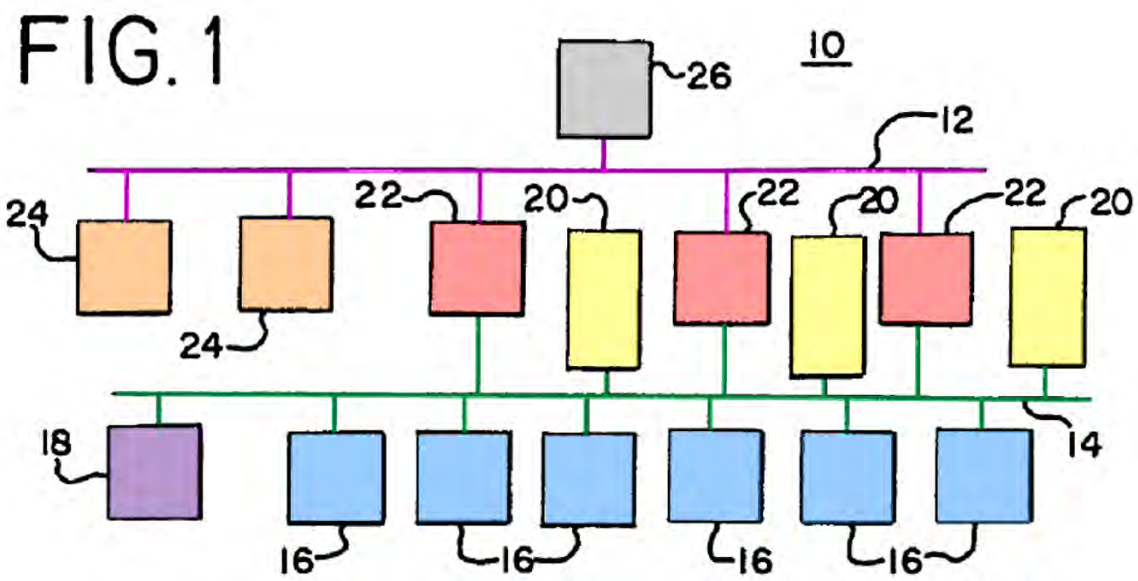
A. Summary of the ’495 Patent

1007. United States Patent No. 7,860,495 (“the ’495 patent”), titled “Wireless building control architecture,” was filed on August 9, 2004, was published on December 28, 2010, and claims a priority date of August 9, 2004. It is directed to “building automation systems. In particular, a

wireless building control architecture [which] implements automation of building systems" (the '495 patent, 1:6-8).

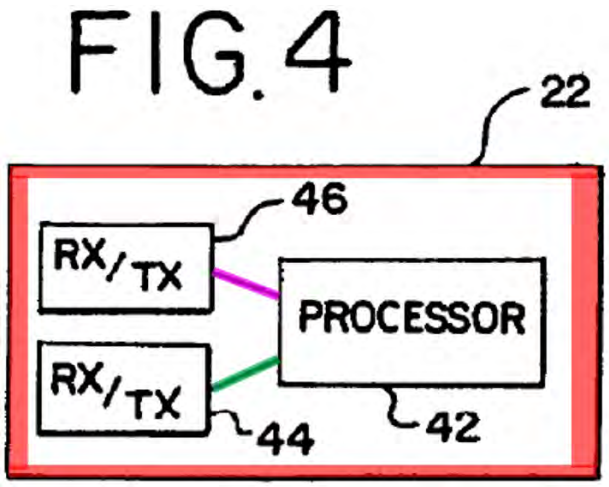
1008. More specifically, the '495 patent purports to disclose an architecture for a wireless building automation system that involves two "levels" or "tiers" of network. The disclosed network architecture comprises a "first wireless network" operable to enable direct communication between individual sensors and actuators which function independently as sensor-actuator groups to set their output state based on local sensor readings without coordinated control oversight from a controller. The disclosed network architecture further comprises a more-complex "second wireless network" operable to receive sensor output data and communicate with actuators while additionally capable of overriding the control activities of the first network, thereby imposing regional control that supersedes local sensor-actuator operation (*see*, e.g., the '495 patent, 2:18-33).

1009. An embodiment of the disclosed multi-tier wireless building automation control system architecture is shown below in the annotated reproduction of Figure 1 from the '495 patent. In this figure, sensors (16), actuators (20), and other building devices (18) communicate over the lower level network (14), which also connects to controllers (22). Meanwhile, controllers (22), management processor or computer (26), and other devices (24) communicate over the high level network (12).



Annotated version of Figure 1 from the '495 patent showing a multi-tier wireless building automation control system architecture, including a lower level network (green lines) and a high level network (pink lines).

1010. The controllers (22) provide a connection between the higher and lower tiers of the network. The patent claims the components of the lower level network may operate "free of input from separate controllers, such as the controller 22 of the high level network 12." Additionally, the patent claims that control processes of the lower level network may implement control processes with input from the controller 22 (*see* '495 patent, 10:30-34). In this respect, "the controllers 22 implement region wide or other modification of local processes" (*see* '495 patent, 10:34-35). The controllers disclosed by the '495 patent "include one or more processors 42 and two transceivers 44, 46" ('495 patent, 10:58-60), as shown in the figure below, such that they may communicate with both the higher and lower level networks.



Annotated version of Figure 4 from the '495 patent showing a block diagram of one embodiment of a controller wherein said controller includes a transceiver for communicating on a lower level network (green line) and a transceiver for communicating on a high level network (pink line).

1011. The '495 patent specification explains that the prior art was susceptible to single point failures, but "[by] direct communication between sensors and actuators, the opportunity for a failed communications link using a hub and spoke arrangement may be avoided" ('495 patent, Abstract, 2:24-27). Embodiments of the '495 patent are additionally directed to provide communication redundancy so that if the individual sensors and actuators within a group lose connection to each other, then the one or more processes implemented by the group still occur. Furthermore, embodiments comprising the two-tiered network architecture disclosed by the '495 patent also enable coordination of control activities outside of the individual sensor/actuator associations – i.e., for enabling the implementation of control processes in one group of actuators that cannot be implemented based on local sensor readings alone.

1012. For instance, the '495 patent describes an example involving the detection of a fire, explaining that "corrective action begins within the immediate region of the sensor generating an alarm signal. The corrective action occurs without routing the alarm signal to upper levels of control processes or across different systems," i.e., by a first level of architecture ('495 patent, 2:39-45). In this example, "the alarm signal is also propagated outward through the network to

upper level control systems [i.e., a second tier of architecture] for generating appropriate responses in other zones" (*Id*.).

1013. During prosecution of the application that issued as the '495 patent (U.S. Patent Application No. 10/915,034), the examiner found the original claims as presented invalid as obvious in view of U.S. Patent No. 6,741,174 ("Rhoades") and U.S. Patent No. 7,339,957 ("Hitt") (*see* April 20, 2009, Non-Final Office Action). In response, the applicant amended, among other things, claim 1 to recite "building components in response to sensors operable within the first wireless network" (*see* July 20, 2009, Response to Non-Final Office Action, emphasis added). The applicant further argued, among other things, that Rhoades did not disclose the first and second wireless networks, and that Hitt does not disclose an actuator that "may also receive information from a central control **as well as** the sensor nodes 160 and 162 much less that the central controller and the sensor nodes are operating in different wireless networks utilizing different communication protocols" (*Id*., emphasis in original). The examiner thereafter issued a Final Office Action repeating the basis for obviousness based on Rhoades and Hitt (November 24, 2009, Final Office Action). In response, the Applicant again attempted to distinguish Rhoades and Hitt, including by arguing that both references did not disclose the concept of a single control system that includes different wireless networks (*see* January 25, 2010, Response to Final Office Action). On February 17, 2010, the examiner issued an Advisory Action maintaining the basis for obviousness, and an Examiner Interview took place on March 18, 2010, where discussions concerning the ground took place (while the nature of the discussions are not disclosed in the USPTO record, the examiner withdrew the Advisory Action). The examiner thereafter issued a Non-Final Office Action finding certain claims (including claims 1 and 2) allowable, and rejecting other claims based on prior art references (*see* May 3, 2010, Non-Final Office Action). In response, the applicant amended certain

non-asserted claims to make them allowable (see January 27, 2010, Response to Non-Final Office Action). The examiner thereafter issued a Notice of Allowance on August 26, 2010.

1014. As demonstrated below, the claim features added by applicant during prosecution were well known at the time, including in view of at least Mesarina, Pasternak, Ahmed, and Herrmann. Pasternak and Mesarina were not before the examiner during prosecution of the application that issued as the '495 patent. I further note that Ahmed and Herrmann were not substantively addressed by the examiner during the prosecution proceedings, other than an unrebutted statement by the examiner that Hermann "discloses self-organizing hierarchical wireless network for surveillance and control."

1015. I further understand that on October 24, 2022, ecobee filed a petition for *inter partes* review with the USPTO seeking to invalidate certain claims of the '495 patent, including the asserted claims (IPR2023-00082, Petition). In the petition, ecobee asserted that one or more claims are obvious over, Pasternak, Pasternak in view of Herrmann, Ahmed, Ahmed in view of Herrmann, Ahmed in view of Pasternak, and Ahmed in view of Mesarina. In response to this petition, Ollnova filed a preliminary response in which it argued that the petition was improper on procedural grounds, and that ecobee had improperly advanced what it argued were conclusory assertions and incorporations by reference, but Ollnova did not otherwise provide a substantive response to the grounds for unpatentability in the petition (IPR2023-00082, Patent Owner Preliminary Response). I understand that, as of the date of this report, the USPTO has not issued an institution decision. I reserve the right to provide further opinions concerning this proceeding as further events occur.

B. Claim Construction for the '495 Patent

1016. I understand that the following term found in the '495 patent asserted claims has been construed by the Court.

Claim Term	Construction
"free of communications with the second wireless network" ('495 patent, claim 1)	Plain and ordinary meaning.

C. Claims 1 and 2 of the '495 Patent Are Obvious to a POSITA in view of Mesarina

1017. Asserted Claims 1 and 2 of the '495 Patent are invalid in view of Mesarina as prior art. As detailed below, it is my opinion that every limitation of the asserted claims would be obvious to a POSITA from the referenced prior art teachings and the knowledge of a skilled artisan.

i. Claim 1

1018. Claim 1 of the '495 Patent recites:

> A control system for wireless building automation control, the control system comprising:
>
> a first wireless network in a building having first wireless communications protocol; and
>
> a second wireless network in the building having a second wireless communications protocol, the first wireless communications protocol different than the second wireless communications protocol;
>
> wherein the first wireless network is operable to control, free of communications with the second wireless network, building components in response to sensors operable within the first wireless network, and wherein the first wireless network is also operable to control the building components in response to data from the second wireless network.

1019. Claim 1 of the '495 Patent claims a control system for a wireless building automation control system comprising both a first and a second wireless network, respectively communicating via a first and a second wireless communications protocol, wherein the first wireless network is operable to control building components in response to sensors in the first wireless network, and that it may do so free of communications with the second wireless network, and further, wherein

the first wireless network is also operable to control the building components in response to data from the second wireless network.

1020. As detailed in an element-by-element analysis below, every limitation of Claim 1 is disclosed, or at least rendered obvious to a POSITA in view of Mesarina.

a. **1[pre] A control system for wireless building automation control, the control system comprising:**

1021. To the extent that the preamble is limiting, Mesarina discloses a control system for wireless building automation control, as discussed in detail below.

1022. More specifically, Mesarina discloses an embodiment wherein "a distributed processing system is implemented using a plurality of computing nodes connected to sensor networks including sensors and actuators" (Mesarina, 2:6-9). Figure 1 of Mesarina, reproduced below, "illustrates a sensor system 100, according to an embodiment, which includes computing nodes 20 that may be programmed by a server 10 using modules. The system 100 includes the server 10, a wireless computing node network 110, and wireless sensor networks 120*a* and 120*b*. The server 10 may include a wide area network (WAN) interface 12 for connecting the server 10 to a WAN, which may include the Internet" (*Id.*, 2:18-25).

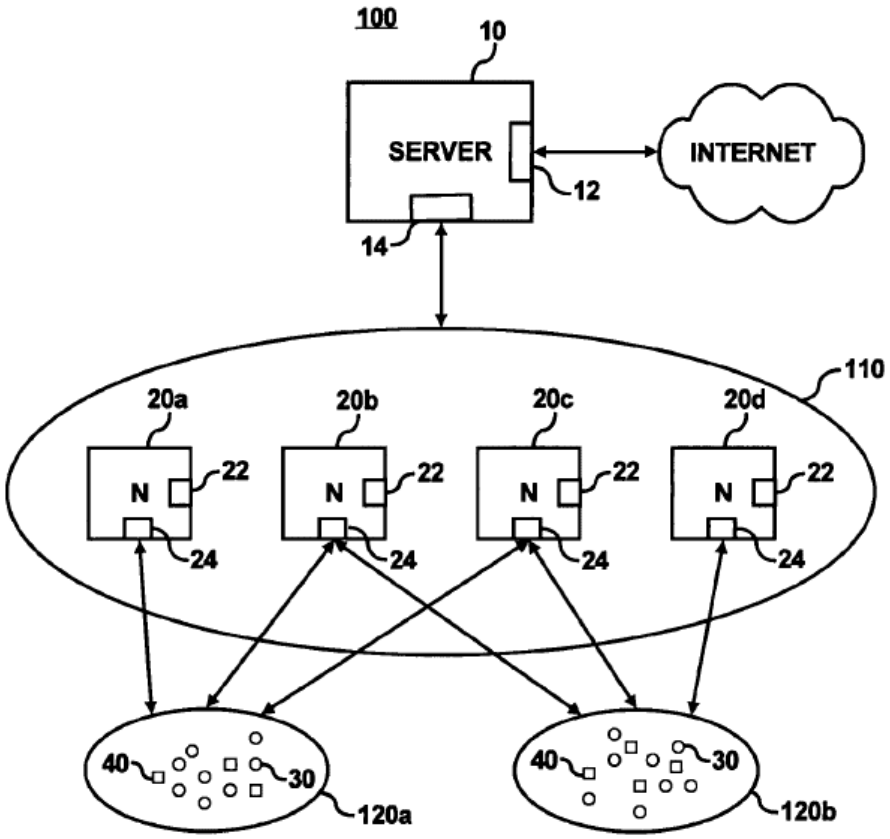


FIG. 1

Figure 1 of Mesarina showing an embodiment of the disclosed sensor system 100.

1023. Thus, Mesarina discloses a plurality of wireless networks including at least a computing node network 110 and wireless sensor networks, 120a and 120b.

1024. According to Mesarina, a "computing node" within the wireless computing node network 110 "is a device operable to perform a function using information received from a sensor, i.e., sensor data. The function may be designated by a module received from the server 10." (*Id*., 2:34-37). As an example, Mesarina explains "the computing node 20a receives temperature data from sensors in the sensor network 120a and performs a function, such as comparing sensed temperatures from the temperature data to a threshold" (*Id*., 2:38-41). The same computing node also "controls an actuator in the sensor network 120a, such as a cooling pump, to increase the

volume of cooling fluid in an air conditioning system if temperatures are above the threshold" (*Id*., 2:42-43).

1025. Thus, for at least the reasons described above, the wireless system disclosed by Mesarina is a wireless control system. Additionally, as explained below, Mesarina's wireless control system is expressly disclosed as applicable to a building automation control system.

1026. For example, Figure 2 of Mesarina, reproduced below, "shows a logical illustration of the architecture of the system 100. The architecture includes a programming space 210, a management space 220, and a sentient space 230" (*Id*., 4:16-18). In this embodiment, "the system 100 is provided in a federal court house," (i.e., a building) (*Id*., 4:26).

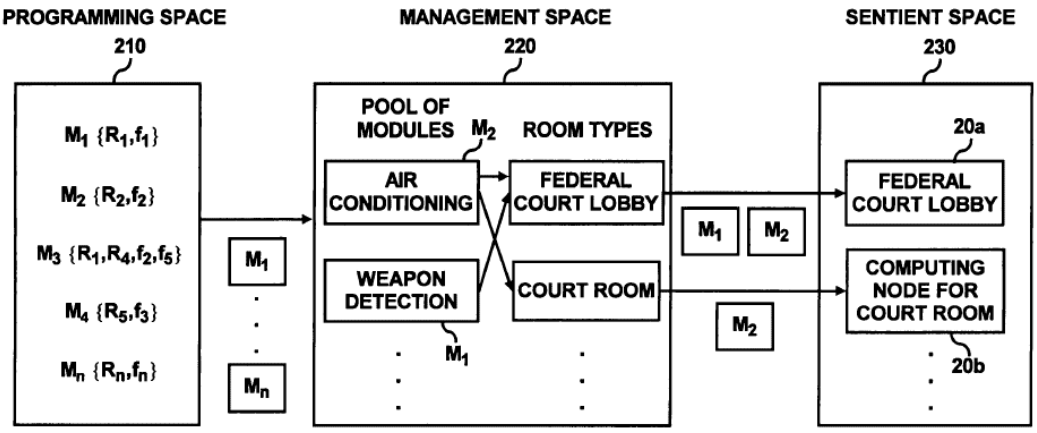


FIG. 2

Figure 2 of Mesarina showing the architecture of the system in Mesarina's Figure 1, applied to the embodiment of a wireless building automation control system in a Federal courthouse.

1027. Mesarina discloses that "[t]he management space 220 includes mapping of modules to room types for determining which room types are associated with each of the computing nodes 20. Room type is associated with the location and/or function of a computing node. For example, the computing node 20a a may be provided in a sensor system installed in a building" (*Id*., 4:59-64). In the context of the embodiment illustrated in Figure 2, Mesarina further discloses that "the server

10 assigns the computing node 20a to the lobby room type and the computing node 20b to the court room [*sic*] room type based, for example, on the locations of the computing nodes 20a and 20b and possibly the functions to be performed by these computing nodes. The server 10 maps the weapon detection module M1 to the lobbies of the federal court house [*sic*], i.e., lobby room type, and the server 10 maps the module M2, such as an air-conditioning control module, to the lobbies and the court rooms of the federal court house, i.e., the lobby and court room [*sic*] room types" (*see*, *Id*., 5:18-29).

1028. Thus, for at least the reasons detailed above, Mesarina discloses "[a] control system for wireless building automation control," as required by the preamble of claim 1 of the '495 patent, to the extent the preamble is determined to be limiting.

b. **1[a] a first wireless network in a building having first wireless communications protocol; and**

1029. The limitations of claim element 1[a] of the '495 Patent are disclosed by Mesarina for at least the reasons detailed below.

1030. Mesarina discloses multiple wireless networks, including the claimed "first wireless network in a building having a first wireless communications protocol," as required by claim element 1[a].

1031. More specifically, Mesarina discloses the system 100 includes "wireless sensor networks 120*a* and 120*b*" (Mesarina, 2:22). Each of computing nodes 20, shown in Mesarina's Figure 1, includes a "wireless network interface 24 for connecting to the sensor networks 120" (*Id*., 2:51-52), and this enables an arrangement wherein "[t]he sensor networks 120, shown as 120a and 120b, include a plurality of sensors 30 and actuators 40" (*Id*., 2:61-62). Similarly, Mesarina states, "[a]ccording to an embodiment, a computing node is connected to a sensor and an actuator" (*Id*., 1:36-37), and further specifies that "'Connected' as used herein means electrically coupled. A

connection may be a direct connection or a connection via one or more components" (*Id.*, 3:7-10). An example of the claimed first wireless network disclosed by Mesarina is shown in the figure below.

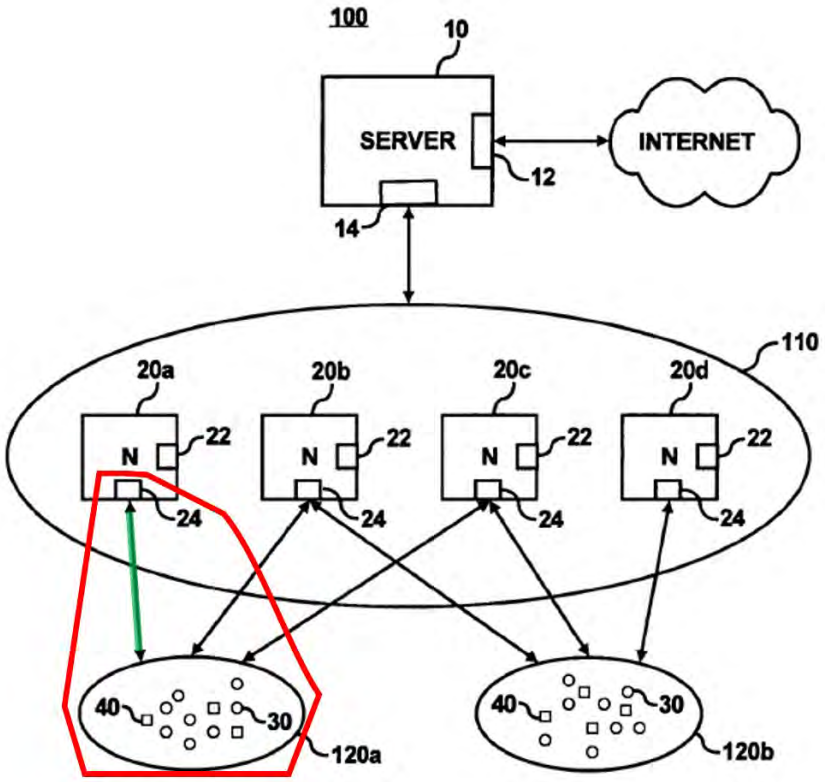


FIG. 1

An annotated version of Figure 1 of Mesarina showing an embodiment of the disclosed sensor system 100. The claimed first wireless network is outlined in red. The line highlighted in green indicates the wireless connection between the sensor network 120a (including sensors and actuators) and the network interface 24 on computing node 20a.

1032. Mesarina explains "[a] sensor includes a device operable to measure or respond to a physical stimulus" (*Id.*, 2:62-63) and non-limiting "[e]xamples of sensors may include temperature, ultrasound, infrared, cameras, etc." Mesarina also explains "[a]n actuator is a device that is operable to move or control another device. Examples of actuators may include automatic doors, audible alarms, visual alarms, communications devices operable to send a communication

in response to a sensor detecting an event, and almost any type of mechanical device" (*Id*., 2:67-3:5).

1033. Thus, Mesarina discloses a first wireless network in a building. Additionally, Mesarina discloses the first wireless network in a building communicating according to a first wireless communications protocol.

1034. As discussed in detail below with respect to claim element 1[b], Mesarina discloses a computing node wireless network in addition to the sensor networks 120. Mesarina also discloses "[f]or example, the sensor networks 120 may include a low-power wireless network that may utilize a wireless protocol different from the computing node network 110" (*Id*., 2:52-55).

1035. Thus, Mesarina discloses a building automation control system comprising "a first wireless network in a building having first wireless communications protocol," as required by claim element 1[a]. Therefore, Mesarina discloses the limitations of claim element 1[a] of the '495 patent.

c. **1[b] a second wireless network in the building having a second wireless communications protocol, the first wireless communications protocol different than the second wireless communications protocol;**

1036. The limitations of claim element 1[b] of the '495 Patent are disclosed by Mesarina for at least the reasons detailed below.

1037. Mesarina discloses multiple wireless networks, including the claimed "second wireless network in the building having a second wireless communications protocol, the first wireless communications protocol different than the second wireless communications protocol," as required by claim element 1[a].

1038. More specifically, with respect to Figure 1, Mesarina explains "[t]he system 100 includes the server 10, a wireless computing node network 110, and wireless sensor networks 120*a* and

120*b*" (Mesarina, 2:18-22). As detailed above with respect to claim element 1[a], the claimed first wireless network is disclosed by Mesarina's computing node 20a interconnecting to wireless sensor network 120a via wireless network interface 24.

1039. Furthermore, Mesarina discloses "[t]he computing node network 110 includes the computing nodes 20 connected via one or more wireless networks" (*Id*., 2:32-34). In addition to wireless network interface 24, the computing nodes 20 include "wireless network interface 22 [which] may be used to connect to the wireless network in the computing node network 110. The wireless network interface 22 may be used to communicate with other computing nodes or possibly the server 10 to receive modules" (*Id*., 2:45-50). Mesarina also explains "the server 10 may be connected to the computing node network 110 via a LAN or the Internet for transmitting modules to the computing nodes 20. The LAN may include a wireless network and/or a wired network" (*Id*., 3:62-65).

1040. Thus, the claimed second wireless network is disclosed by Mesarina's computing node network 110, comprising one or more computing nodes 20, interconnected via wireless network interface 24, together with the server 10 via network interface 14. Mesarina further discloses that the second wireless network communicates via a second wireless communications protocol, which is different from the first wireless communications protocol.

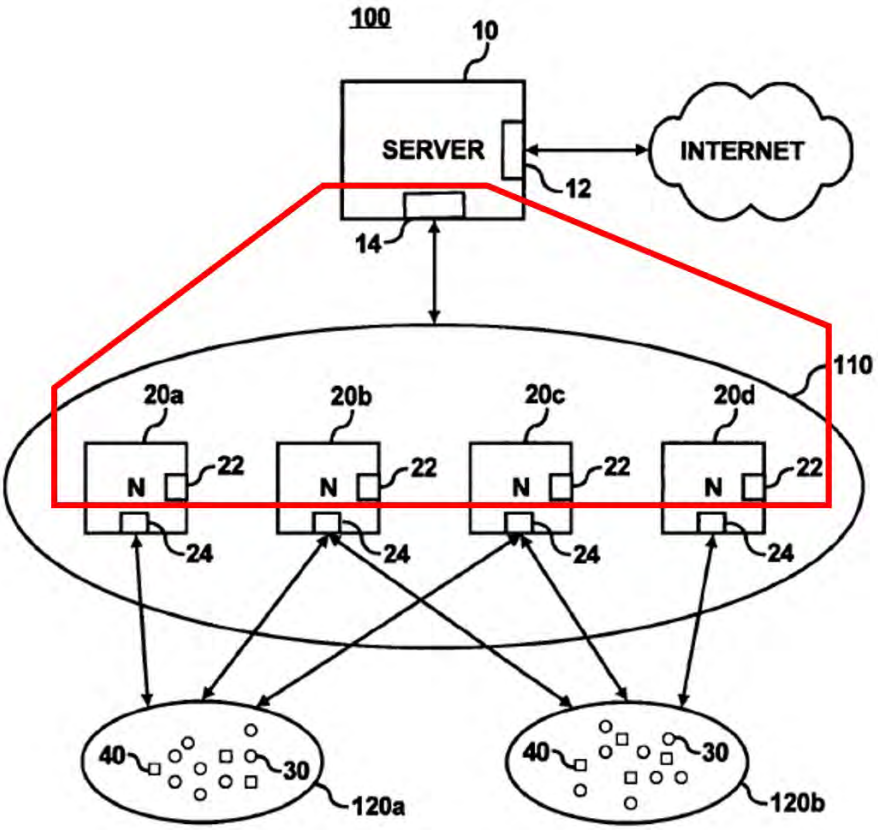


FIG. 1

An annotated version Figure 1 of Mesarina showing an embodiment of the disclosed sensor system 100. The claimed second wireless network is outlined in red.

1041. More specifically, Mesarina discloses the "[t]he computing nodes 20 have relatively large communication ranges that allow them to communicate with other computing nodes 20 in the computing node network 110" (*Id.*, 6:28-31). In comparison, the sensor networks 120 "may be a low-power wireless network with a smaller range than the wireless network used in the computing network 110. For example, the sensors 30 and actuators 40 may include battery operated devices, and thus a low-power wireless network may be used to conserve energy and maximize battery life" (*Id.*, 3:16-21). Notably, Mesarina discloses the sensor networks 120 "may utilize **a wireless protocol different from the computing node network 110**" (*Id.*, 2:54-55, emphasis added).

1042. Furthermore, the embodiment illustrated in Figure 2 of Mesarina expressly shows that multiple computing nodes are contained within the building (i.e., both in the Federal Court house). Hence, both the first wireless network and the second wireless network are operable to communicate via their respective first and second wireless protocols *within the building*.

1043. Thus, Mesarina discloses a building automation control system comprising both a first wireless network having a first wireless communications protocol as well as a second wireless network having a second wireless communications protocol, wherein the first wireless communications protocol is different than the second wireless communications protocol. Therefore, Mesarina discloses the limitations of claim element 1[b] of the '495 Patent.

d. **1[c] wherein the first wireless network is operable to control, free of communications with the second wireless network, building components in response to sensors operable within the first wireless network, and wherein the first wireless network is also operable to control the building components in response to data from the second wireless network.**

1044. As an initial matter, I understand that the Court has ruled that the claim term "free of communications with the second wireless network" is to have its plain and ordinary meaning. I have adopted this meaning throughout my analysis.

1045. The limitations of claim element 1[c] of the '495 Patent are disclosed by Mesarina for at least the reasons detailed below.

1046. Mesarina discloses that the first wireless network within the building automation system is operable to control building components in response to sensors, and that it can do so free of communications with the second wireless network. In the exemplary embodiment of a Figure 1, Mesarina discloses that "a distributed processing system is implemented using a plurality of computing nodes connected to sensor networks including sensors and actuators" (Mesarina, 2:6-9). Mesarina explains that the relationship between computing nodes and sensors and actuators

within the disclosed sensor network(s) are dictated by programming that is either pre-installed or transmitted via a communications means and then installed. For example, Mesarina states "[e]ach computing node may be programmed by transmitting modules to the computing nodes" (*Id*., 2:9-10). According to Mesarina,

> A module may include at least one function and at least one relationship. The relationship identifies an association between a producer of data and a consumer of the data. For example, the relationship identifies a sensor generating sensor data and an actuator controlled by a computing node based on the sensor data. The function designates a processing function for processing the sensor (*Id*., 2:10-17).

1047. Mesarina explains, "[f]or example, a computing node determines which sensors and actuators to communicate with based on the relationships in the modules for the computing node and determines which functions to perform based on functions in the modules" (*Id.*, 5:67-6:4).

1048. In one embodiment disclosed by Mesarina "the computing node 20*a* is programmed using the modules received from the server 10. Programming the computing node 20*a* with the modules may include compiling, installing, and/or executing the modules. The computing node 20*a* then uses the modules to process sensor data and control actuators based on the results of the processing" (*Id*., 8:28-33). While the computing node receives information from the server or other computing nodes, it may also send information back to the server. For instance, Mesarina states "[t]he computing node 20*a* transmits its location information and the sensors and actuators that are connected to the computing node 20*a* to the server 10. The server 10 determines that the computing node 20*a* is in a lobby based on its location and then assigns the computing node 20*a* to the lobby room type. If the computing node 20*a* is moved or is mobile, then new location information is transmitted to the server 10" (*Id*., 4:64-5:4, see also, e.g., 5:56-61)

1049. The disclosures of Mesarina additionally indicate that a computing node may be programmed with a module *without* requiring communication from the server. For example, a computing node may be pre-programmed based on sensor/actuator locations and related programming used in other system installations or based on calculations performed prior to activating the system. In particular, while the relationship between modules and computing nodes may be based on sensor/actuator type and locations (*see*, e.g., *Id*., 4:59-5:37), such "location information may be predetermined and stored in computing node 20*a*, such as during installation" (*Id*., 9:66-10:1). Mesarina further states that the method carried out by the system disclosed therein "may be implemented as software embedded on a computer readable medium, such as the memory 706 and/or 708" (*Id*., 11:11-13) shown in the block diagram of an exemplary computing node in Figure 7.

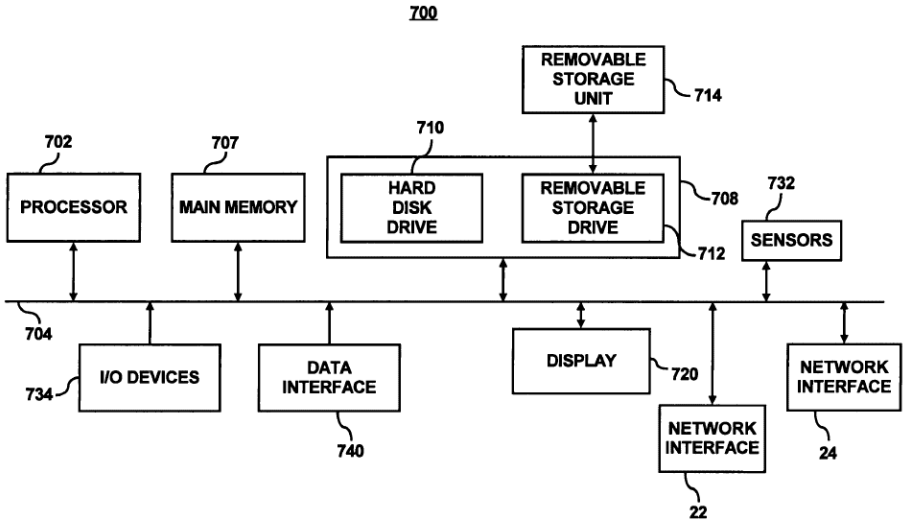


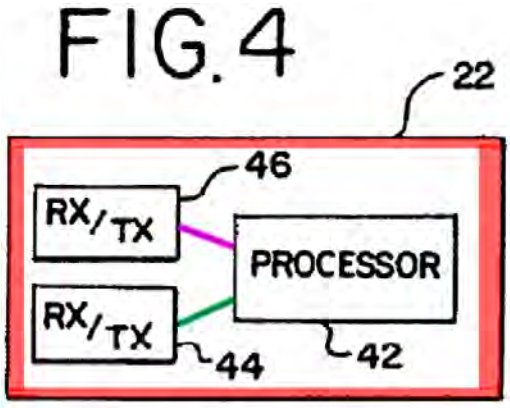
FIG. 7

Figure 7 of Mesarina showing a block diagram of a computing node.

1050. Once the system is operable (i.e., the module has been installed), communication between the sensor network and computing node to effectuate building control may occur "free of communications with the second wireless network," as required by claim element 1[c]. Although each computing node 20 includes an interface 22 capable of communicating with second network,

the building components on the first network are controlled in response to sensors operable within the first wireless network, and this does not include or necessitate communications with the second wireless network.

1051. Moreover, communication between the sensor network and computing node to control building components may occur "free of communications with any component on the second wireless network," in accordance with the plain and ordinary meaning of the term, at least because the second network interface 22 in the computing node 20a will not be a required component of the information exchange process. Indeed, this configuration is effectively identical to what is disclosed in the '495 Patent with respect to Figure 4, an annotated version of which is reproduced below, in which a single "controller" includes an interface for communication via both the first and second wireless networks, yet still permits control of building components on the first wireless network in response to sensors on the first wireless network, free of communications with the second wireless network.



Annotated version of '495 Patent Figure 4 showing a block diagram of a single controller which includes both a transmitter/receiver interface for communication with a first wireless network (indicated by the line highlighted in green), as well as a transmitter/receiver interface for communication with a second wireless network (indicated by the line highlighted in pink),

1052. Mesarina discloses "[t]he sensors 30 and the actuators 40 are connected via a wireless network to the computing nodes 20" (*Id*., 3:6-7), and describes embodiments wherein communication between a computing node and one or more sensors and/or actuators in the sensors network takes place in a building and free of communication with the second wireless network. For instance, Mesarina discloses "the computing node 20*a* receives temperature data from sensors in the sensor network 120*a* and performs a function, such as comparing sensed temperatures from the temperature data to a threshold. The computing node 20*a* controls an actuator in the sensor network 120*a*, such as a cooling pump, to increase the volume of cooling fluid in an air conditioning system if temperatures are above the threshold" (*Id*., 2:38-44). Thus, Mesarina discloses the first wireless network is operable to control building components in response to sensors operable within the first wireless network, and that it may do so free of communications with the second wireless network

1053. Furthermore, Mesarina discloses "the first wireless network is also operable to control the building components in response to data from the second wireless network," as required by claim element 1[c]. In particular, Mesarina explains "[a] computing node is a device operable to perform a function using information received from a sensor, i.e., sensor data. The function may be designated by a module received from the server 10" (*Id*., 2:34-37). In one embodiment "the computing node 20a is programmed using the modules received from the server 10. Programming the computing node 20a with the modules may include compiling, installing, and/or executing the modules. The computing node 20a then uses the modules to process sensor data and control actuators based on the results of the processing" (*Id*., 8:28-33). Thus, Mesarina discloses that a computing node may be programmed with "new modules or updates to previously installed modules" (*Id*., 5:59-60) communicated from server 10 to the computing node in the second wireless network. Such "new modules or updates" constitute data from the second wireless

network that may alter, modify, or change the functions and/or relationships defining how the first wireless network controls building components.

1054. Thus, it is my opinion that the disclosures of Mesarina would have rendered obvious to a POSITA the limitations of a building automation control system wherein a "first wireless network is operable to control, free of communications with the second wireless network, building components in response to sensors operable within the first wireless network, and wherein the first wireless network is also operable to control the building components in response to data from the second wireless network," as recited by claim element 1[c]. Therefore, for at least the reasons detailed above, it is my opinion that each and every limitation of claim 1 of the '495 Patent is disclosed or rendered obvious by Mesarina with the general knowledge of a POSITA.

ii.Claim 2

1055. Claim 2 of the '495 Patent recites:

> The control system of claim 1 wherein the first wireless communications protocol has a first bandwidth and the second wireless communications protocol has a second bandwidth, the first bandwidth less than the second bandwidth.

1056. Claim 2 of the '495 Patent depends upon claim 1, and places additional limitations pertaining to the first and second wireless communications protocols. In particular, claim 2 requires that the bandwidth of the first wireless communications protocol is less than the bandwidth of the second wireless communications protocol. For at least the reasons detailed above in relation to Claim 1, it is my opinion that the disclosures of Mesarina render obvious to a POSITA the limitations of Claim 1. Furthermore, as explained below, it is my opinion that each and every limitation added to Claim 1 of the '495 Patent by Claim 2 is also rendered obvious to a POSITA in view of Mesarina.

1057. As detailed above with respect to claim elements 1[a] and 1[b], Mesarina discloses that the system of Figure 1 includes both a first wireless network communicating via a first wireless network communications protocol, and a second wireless network, communicating via a second wireless communications protocol, and further, that the respective first and second wireless communications protocols may be different from one another. For instance, Mesarina discloses embodiments wherein "[t]he wireless [sensor] network may be a low-power wireless network with a smaller range than the wireless network used in the computing network 110. For example, the sensors 30 and actuators 40 may include battery operated devices, and thus a low-power wireless network may be used to conserve energy and maximize battery life" (Mesarina, 3:16-21). By comparison, Mesarina states "[t]he computing nodes 20 have relatively large communication ranges that allow them to communicate with other computing nodes 20 in the computing node network 110" (*Id*., 6:28-31).

1058. It would have been well-known to a POSITA that a wireless network employed for short range communications between relatively simple, low-power devices such as sensors and actuators would require less bandwidth than a wireless network employed for long range communications between more complicated controllers. A POSITA would have also understood that the differences among the respective first and second wireless protocols would include differences in physical characteristics of the associated communication signals, including bandwidth. This is also made evident by Mesarina wherein it is contemplated that the availability of computing resources and runtime conditions will impact decisions pertaining to communication among system components (e.g., signal routing, and the use of redundant functionality).

1059. According to Mesarina, "[c]omputing resources may be hardware or software in the computing node and the availability of computing resources may be based on the performance of

the hardware or software," example of which include processor speed and storage capacity, while "[r]untime conditions are conditions that may affect the processing of sensor data and control of actuators. Runtime conditions may be associated with transmitting sensor data or transmitting commands for controlling actuators in the wireless networks. Such as bit error rate on a communication channel, bandwidth, delay, etc." (*Id*., 6:9-25)

1060. Thus, the disclosures of Mesarina would have rendered obvious to a POSITA that the first and second wireless communications protocol could comprise first and second bandwidths, respectively, that are not the same. Moreover, the disclosures of Mesarina would have rendered obvious to a POSITA that the first bandwidth (associated with the short range low-power wireless network) would be less than the second bandwidth of the computing node network.

1061. Consequently, for at least the reasons presented here, it is my opinion that Claim 2 of the '495 Patent is rendered obvious by Mesarina with the knowledge of a POSITA.

D. Claims 1 and 2 of the '495 Patent Are Obvious to a POSITA in view of Herrmann

1062. Asserted Claims 1 and 2 of the '495 Patent are invalid in view of Herrmann as prior art. As detailed below, it is my opinion that every limitation of the asserted claims would be obvious to a POSITA from the referenced prior art teachings and the knowledge of a skilled artisan.

i. Claim 1

1063. Claim 1 of the '495 Patent recites:

> A control system for wireless building automation control, the control system comprising:
>
> a first wireless network in a building having first wireless communications protocol; and
>
> a second wireless network in the building having a second wireless communications protocol, the first wireless communications protocol different than the second wireless communications protocol;

> wherein the first wireless network is operable to control, free of communications with the second wireless network, building components in response to sensors operable within the first wireless network, and wherein the first wireless network is also operable to control the building components in response to data from the second wireless network.

1064. Claim 1 of the ’495 Patent claims a control system for a wireless building automation control system comprising both a first and a second wireless network, respectively communicating via a first and a second wireless communications protocol, wherein the first wireless network is operable to control building components in response to sensors in the first wireless network, and that it may do so free of communications with the second wireless network, and further, wherein the first wireless network is also operable to control the building components in response to data from the second wireless network.

1065. As detailed in an element-by-element analysis below, every limitation of Claim 1 is disclosed, or at least rendered obvious to a POSITA in view of Herrmann.

a. **1[pre] A control system for wireless building automation control, the control system comprising:**

1066. To the extent that the preamble is limiting, Herrmann discloses a control system for wireless building automation control, as described below.

1067. According to the disclosures of Herrmann, “[t]he present invention relates to a wireless network of sensors and actuators for surveillance and control, and a method of operation for the network” (Herrmann, [0002, 0007], emphasis added). Thus, Herrmann discloses a wireless control system.

1068. Furthermore, Herrmann explains the wireless control system disclosed therein is applicable to a building automation control system. For example, Herrmann states that applications for the

wireless network of sensors and actuators "include, but are not limited to, security systems, home automation, climate control, and control and surveillance of industrial plants" (*Id*., [0007]).

1069. Thus, for at least the reasons detailed above, Herrmann discloses "[a] control system for wireless building automation control," as required by the preamble of claim 1 of the '495 patent, to the extent the preamble is determined to be limiting.

b. **1[a] a first wireless network in a building having first wireless communications protocol; and**

1070. The limitations of claim element 1[a] of the '495 Patent are disclosed by Herrmann for at least the reasons detailed below.

1071. Herrmann discloses a first wireless network as a sensor/actuator network comprising sensor nodes, actuator nodes, and a cluster head. In particular, Herrmann discloses an exemplary embodiment comprising a "network [that] may include two physical portions or layers" (Herrmann, [0008]). In this embodiment, one "physical layer may connect a small number of relatively more complex devices to form a wireless backbone network" (*Id*.), while another "physical layer may connect a large number of relatively less complex low power devices with each other and with the backbone nodes" (*Id*.). The network comprising this latter physical layer described by Herrmann constitutes the claimed "first wireless network," required by claim element 1[a].

1072. Further detail of Herrmann's two-layer hierarchical wireless control network is described in relation to Figure 2 of Herrmann, reproduced below, which includes "a schematic drawing of a hierarchical ad-hoc network absent a central control unit" (*Id*., [0015]).

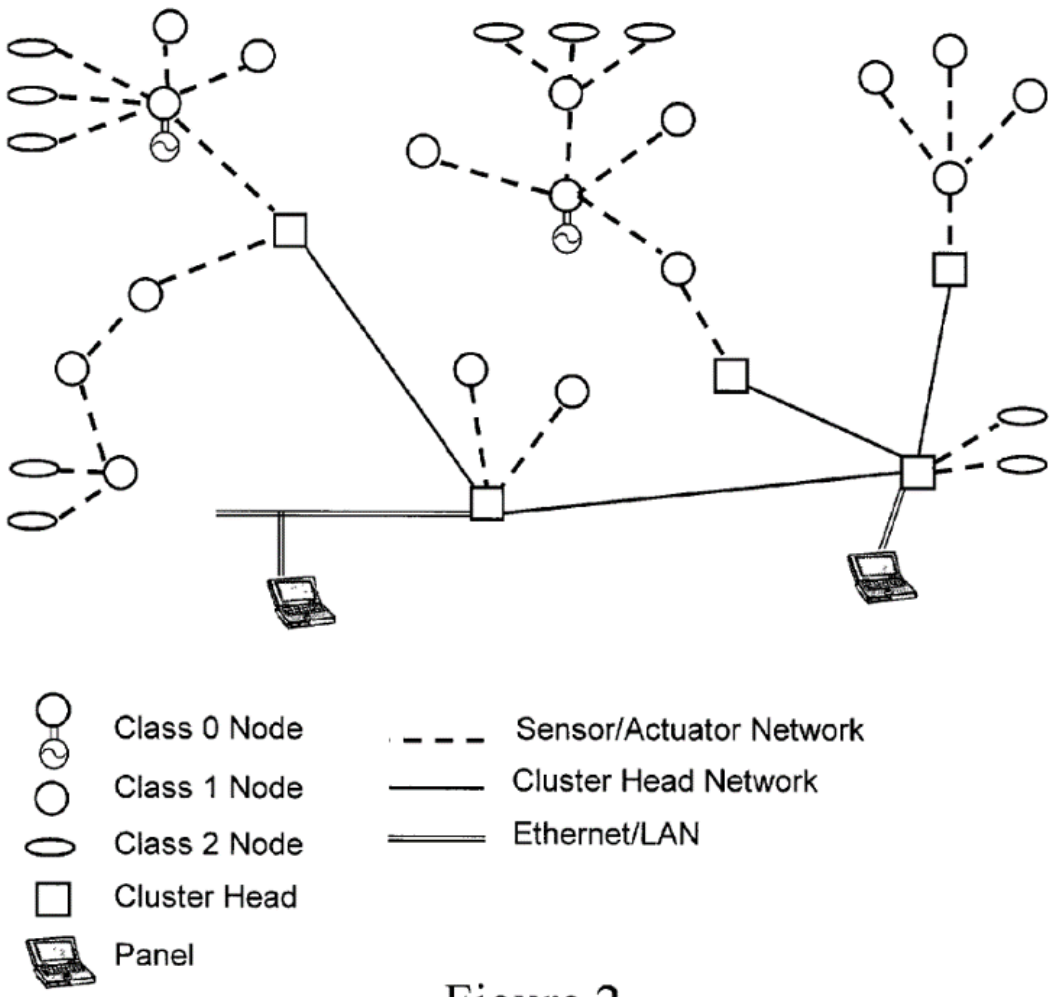


Figure 2

Reproduction of Figure 2 in Herrmann, illustrating the topology of the hierarchical ad-hoc network without a central control unit.

1073. With respect to Figure 2, Herrmann explains,

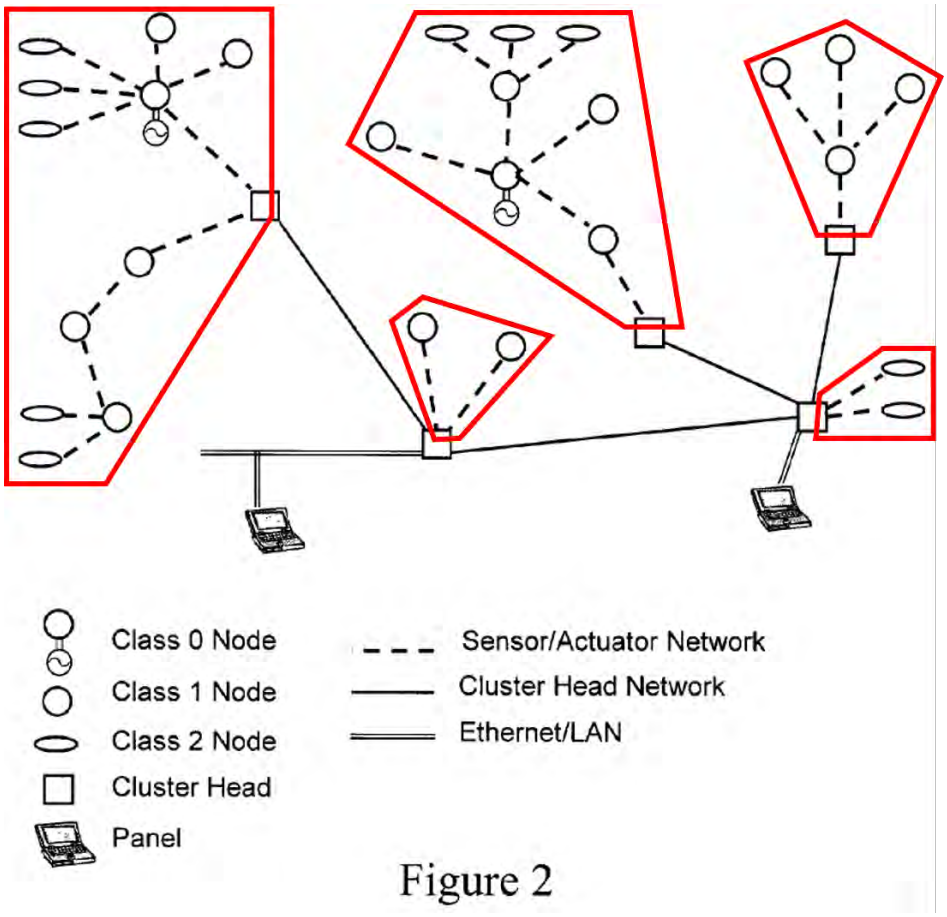
> The network may include devices of different types with varying complexity and functionality. In particular, the network may include a battery-powered sensor/actuator node (also referred to a Class 1 node), a power-line powered sensor/actuator node (also referred to as a Class 0 node), a battery-powered sensor/actuator node with limited capabilities (also referred to as a Class 2 node), a cluster head, and a panel. The network may also include, for example, a battery-powered node or input device (e.g., key fob) with limited capabilities, which may not be a "fixed" part of the actual network topology, or a RF transmitter device (also referred to as a Class 3 node) (*Id.*, [0015]).

1074. Herrmann further discloses that the Class 1 (battery-powered) sensors and actuators include a data interface and "[t]hrough a data interface, the sensor or actuator may be connected to a low-power microcontroller to process the raw sensor signal or to provide the actuator with the required control information, respectively" (Id., [0018]). Furthermore, "[t]he microcontroller may be further connected to a low power (such as, for sample, short to medium range) RF radio transceiver module. Alternatively, the sensor or actuator may include its own microcontroller interfaced with a dedicated network node controller to handle the network protocol and interface the radio." (*Id*., [0019]). In other words, the sensor and actuator nodes communicate with the use of radio transceivers.

1075. Herrmann explains that "[r]elaying of the data may occur in short hops from remote sensors or to remote actuators" [0013], and further indicates that "Class 1 nodes may be fully functional network nodes, for example, capable of serving as a multi-hop point" [0018]. Thus, communication may take place directly between sensor and actuator nodes.

1076. Additionally, the exemplary embodiment disclosed by Herrmann includes network components referred to as "cluster heads." Herrmann states "[c]luster heads are dedicated network control nodes. They may additionally but not necessarily perform sensor or actuator functions" (Id., [0026]). Herrmann also indicates "[c]luster heads may further include a short or medium range radio module ("Radio 1') for communication with the sensor/actuator nodes" (*Id*., [0026]).

1077. Thus, for at least the reasons detailed above, Herrmann's "sensor/actuator network" (*Id*., [0028]), comprising sensor and actuator nodes capable of communicating both among themselves and with a cluster head, discloses a "first wireless network in a building," as required by claim element 1[a]. Portions of Herrmann's hierarchical ad-hoc decentralized network identified in the figure below may each constitute a "first wireless network."



Annotated version of Figure 2 of Herrmann. Examples of the claimed "first wireless network" are outlined in red.

1078. Herrmann also discloses a first wireless network in a building having *first wireless communications protocol*.

1079. With respect to the exemplar embodiment in Figure 2, Herrmann discloses the microcontrollers connected to, or integrated within, the sensor/actuator nodes "handle the network protocol and interface the radio," (Id., [0019]) "and may store data in both volatile and non-volatile memory" (Id., [0018]). Said "network protocol" is applicable to the wireless communications means among the sensor/actuator nodes and between these nodes and the cluster head communicating via "Radio 1" (see, e.g., *Id*., [0026]). Therefore, Herrmann discloses that its first wireless network in a building communicates according to "a first wireless communications protocol," as required by claim element 1[a].

1080. Thus, for at least the reasons detailed above, Herrmann discloses a building automation control system comprising "a first wireless network in a building," and that said first wireless network has (i.e., communicates via a) "first wireless communications protocol," as recited by claim element 1[a]. Therefore, Herrmann discloses the limitations of claim element 1[a] of the '495 patent.

c. **1[b] a second wireless network in the building having a second wireless communications protocol, the first wireless communications protocol different than the second wireless communications protocol;**

1081. The limitations of claim element 1[b] of the '495 Patent are disclosed by Herrmann for at least the reasons detailed below.

1082. Herrmann discloses a second wireless network as a network of intercommunicating cluster heads. This second network may further include one or more "panels" (e.g., computers). In particular, Herrmann discloses an exemplary embodiment comprising a "network [that] may include two physical portions or layers" (Herrmann, [0008]). In this embodiment, one "physical layer may connect a small number of relatively more complex devices to form a wireless backbone network," (*Id*.) while another "physical layer may connect a large number of relatively less complex low power devices with each other and with the backbone nodes" (*Id*.). The network comprising the former physical layer described by Herrmann constitutes the claimed "second wireless network," required by claim element 1[b].

1083. As detailed above, with respect to Figure 2 of Herrmann, "[c]luster heads are dedicated network control nodes," which may "include a short or medium range radio module ("Radio 1') for communication with the sensor/actuator nodes" (*Id*., [0026]). Furthermore, Herrmann discloses "[f]or communication with other cluster heads, cluster heads may in addition include a second RF transceiver ("Radio 2") with a larger bandwidth and/or longer communication range,

such as, for example, but not necessarily at another frequency band than the Radio 1" (*Id*.). This inter-connected network of cluster heads communicating on Radio 2 corresponds to the claimed second wireless network.

1084. Herrmann explains that the cluster heads may have different properties and capabilities compared to the sensor/actuator nodes. For instance,

> [t]he microcontroller of the cluster heads may be more capable, for example, in terms of clock speed and memory size, than the microcontrollers of the sensor/actuator nodes. For example, the microcontroller of the cluster heads may run several software programs to coordinate the communication with other cluster heads (as may be required, for example, by the clusterhead network), to control the sensor/actuator network, and to interpret and store information retrieved from sensors and other cluster heads (database) (*Id*., [0028]).

1085. According to Herrmann, the network layer configuration is beneficial, as "[s]uch an arrangement of two separate physical layers may impose less severe energy constraints upon the network" (*Id*., [0008]).

1086. In addition to the communication that may take place between cluster heads communicating on Radio 2, Herrmann discloses "a cluster head may include a standard wire-based or wireless transceiver, such as, for example, an Ethernet or Bluetooth transceiver, in order to connect to any stationary, mobile, or handheld computer ("panel") with the same interface. This functionality may also be performed wirelessly by one of the radio modules" (Id., [0028], see also, e.g., [0030, 0038]). Thus, Herrmann discloses a network of cluster heads which may be connected to one or more panel computers, which together constitute the claimed "second wireless network in the building," as depicted in the annotated version of Herrmann's Figure 2 shown below.

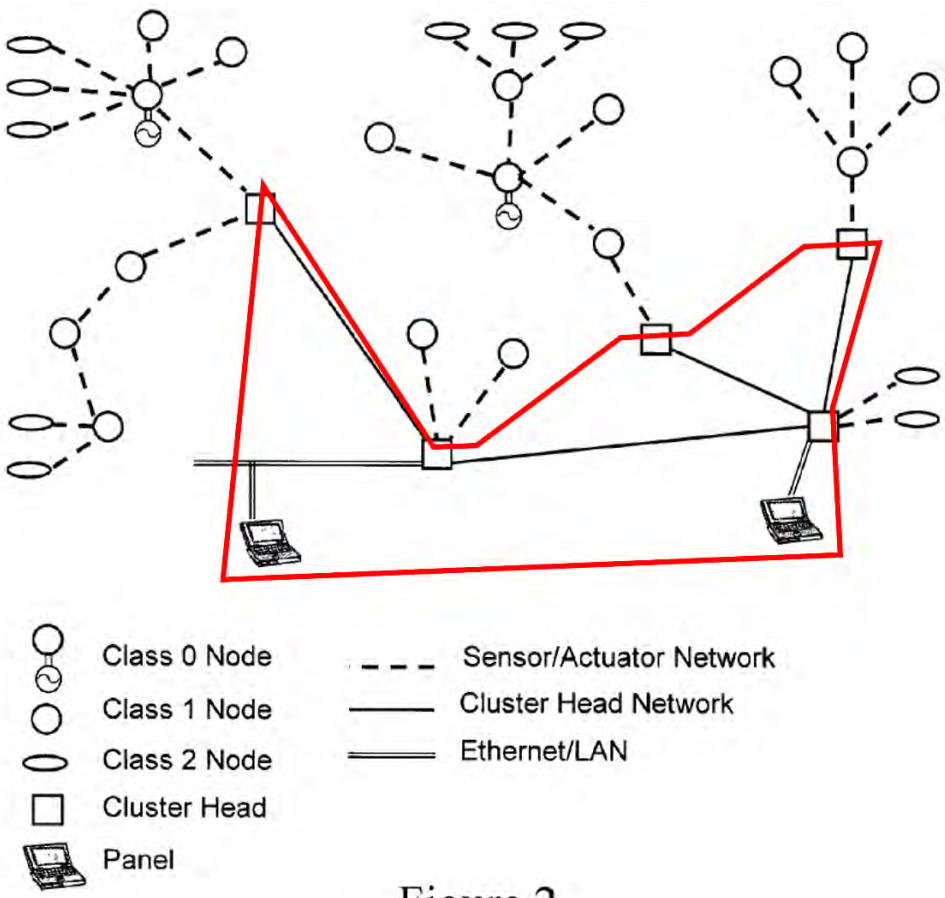


Figure 2

Annotated version of Figure 2 of Herrmann. The claimed "second wireless network" is outlined in red.

1087. Herrmann also discloses that the second wireless communicates via a *second wireless communications protocol*, as required by claim element 1[b]. For instance, as indicated above, Herrmann discloses that the cluster heads may communicate on a wireless network using "RF transceiver ('Radio 2')" (*Id*., [0026]), and that such a transceiver using, for example, Ethernet or Bluetooth, may "connect to any stationary, mobile, or handheld computer ('panel') with the same interface" (*Id*., [0028]). Herrmann further discloses that "standardized layered protocols including, for example, Bluetooth, IEEE 802.11, or IEEE 802.15" [0041] for the cluster head network, and "[b]y using standardized protocols, standardized radio transceivers may be used as 'Radio 2'. Furthermore, the use of standardized protocols may provide special features and/or services" (*Id*.,

[0042]). Therefore, Herrmann expressly discloses a second wireless network having a second wireless communications protocol, as required by claim element 1[b].

1088. Yet further, Herrmann discloses that the first wireless communications protocol used for communications within the first wireless network is different than the second wireless communications protocol used for communications within the second wireless network. More specifically, Herrmann discloses that the 'Radio 2' transceiver in a cluster head, used for communication with other cluster heads, may include "a larger bandwidth and/or longer communication range, such as, for example, but not necessarily at another frequency band than the Radio 1" (*Id*., [0026]). A POSITA would understand that two sets of wireless radio transceivers, operating with different bandwidths, centered at different frequency bands, operating with different power levels to communicate across different distances, would be optimally configured to utilize different wireless communication protocols.

1089. As an example, Herrmann discloses 'Radio 2' transceivers "may operate 50 to 500 meters" apart, (*Id*., [0032]) while 'Radio 1' transceivers "may operate 10 to 100 meters" apart, (*Id*., [0034]) in accord with maximum transmission ranges of the respective radio transceivers. Herrmann further indicates that when installing the hierarchical network according to an exemplary embodiment, "the depth of the network, i.e., the number of hops from a node at the periphery of the network in order to reach the nearest cluster head, should be limited according to the latency requirements of the current application (such as, for example, 1 to 10 hops)" (*Id*.).

1090. Additionally, the "Background" section of Herrmann's specification notes that "[b]attery-powered versions of the aforementioned sensors and actuators may be deployed with built-in wireless transmitters and/or receivers, as described in, for example, U.S. Pat. Nos. 5,854,994 and 6,255,942" (*Id*., [0005]). That is, Herrmann references prior art which disclosed the sensors and

actuators used within the exemplary hierarchical ad-hoc network. Yet further, said prior art references refer to more than one protocol for wireless communication, and U.S. Patent 6,255,942 discloses more than one protocol used simultaneously within an embodiment.

1091. Thus, Herrmann discloses a building automation control system comprising both a first wireless network having a first wireless communications protocol as well as a second wireless network having a second wireless communications protocol, wherein the first wireless communications protocol is different than the second wireless communications protocol. Therefore, Herrmann discloses the limitations of claim element 1[b] of the '495 Patent.

d. **1[c] wherein the first wireless network is operable to control, free of communications with the second wireless network, building components in response to sensors operable within the first wireless network, and wherein the first wireless network is also operable to control the building components in response to data from the second wireless network.**

1092. The limitations of claim element 1[c] of the '495 Patent are disclosed by Herrmann for at least the reasons detailed below.

1093. As an initial matter, I understand that the Court has ruled that the claim term "free of communications with the second wireless network" is to have its plain and ordinary meaning. I have adopted this meaning throughout my analysis.

1094. Herrmann discloses that the first wireless network is operable to control building components in response to sensors operable within the first wireless network, as required by claim element 1[c].

1095. As detailed above with respect to claim element 1[a], Herrmann discloses a sensor/actuator network comprising sensor nodes and actuator nodes, as well as a cluster head, wherein said sensor/actuator network constitutes a "first wireless network." Furthermore, Herrmann discloses non-limiting examples of such sensor and actuator nodes, including "smoke detectors, motion

detectors, temperature sensors, door/window contacts, alarm sounders, or valve actuators" (Herrmann, [0007]), and that applications of such sensors and actuators "may include, but are not limited to, security systems, home automation, climate control, and control and surveillance of industrial plants" (*Id*.). Thus, Herrmann discloses nodes of the sensor/actuator network that are operable to control building components as part of a building automation control system.

1096. As discussed above with respect to claim element 1[a], Herrmann discloses the sensor nodes and actuator nodes, which are associated with one of the two physical layers that constitute the hierarchical ad-hoc network, communicate within a first wireless network via a first wireless communications protocol. As also explained above with respect to claim element 1[a], "[c]luster heads may further include a short or medium range radio module ("Radio 1") for communication with the sensor/actuator nodes," (*Id*., [0026]) and thus include a transceiver for communication within the first wireless network. Although Herrmann discloses that the cluster heads may communicate with one another on a wireless network using "RF transceiver ('Radio 2')" (*Id*., [0026]), the first wireless network is nonetheless operable to control building components in response to sensors operable within the first wireless network, and to do so "free of communications with the second wireless network," as required by claim element 1[c].

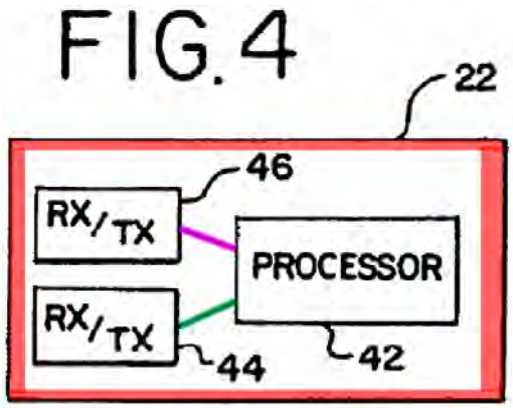
1097. For instance, Herrmann describes that "[r]elaying of the data may occur in short hops from" and to nodes of the sensor/actuator network (*Id*., [0013]). More specifically, Herrmann discloses Class 1 nodes within the exemplary hierarchical network control system, wherein "Class 1 sensor/actuator nodes may be battery-powered devices that include sensor elements to sense one or more physical quantities, or an actuator to perform required actuations" (*Id*., [0017]). Herrmann further discloses that "**Class 1 nodes may be fully functional network nodes, for example, capable of serving as a multi-hop point**" (*Id*., [0018]), and that "**the sensor or actuator may**

include its own microcontroller interfaced with a dedicated network node controller to handle the network protocol and interface the radio" (*Id*., [0019]). Thus, the relay of data hops between nodes of the sensor/actuator network constitutes communication without including the cluster head and thus is necessarily a form of wireless network communication control that is free of communications with the second wireless network.

1098. According to Herrmann "[d]uring normal operation, the sensor/actuator nodes may operate in an energy-efficient mode with very low duty cycle" (*Id*., [0074]), wherein "[t]he transceiver and the microcontroller may be predominantly in a power save or sleep mode" (*Id*.). Herrmann further contemplates the relevance of energy-efficiency and how this necessitates the minimization of communications by nodes of the sensor/actuator network. A POSITA would have understood that avoiding unnecessary communication beyond what is required to control a local sensor and actuator nodes would entail avoiding non-essential communications with a cluster head. And thus, it would have been obvious to a POSITA that sensors and actuators of a sensor/actuator network may communicate among themselves to execute local control of building components associated with the first wireless network, and that this would be free of communications with the second wireless network.

1099. Cluster heads in Herrmann's exemplary embodiments are capable of communication with sensor/actuator nodes at least to derive the complete topology of the sensor/actuator network (*see*, e.g., *Id*., [0052]). However, after such a network initialization step is complete, a POSITA would have understood that communication could occur without additional need to communicate via the cluster head. Thus, the first wireless network would once again be operable to control, free of communications with the second wireless network, building components in response to sensors operable within the first wireless network.

1100. Moreover, communication between the sensor/actuator nodes and the cluster head to effectuate building control may occur "free of communications with any component on the second wireless network" in accordance with the plain and ordinary meaning of the term at least because control of building components may be performed without the use of the cluster head's Radio 2. That is, the cluster head will necessarily have two transceivers for communicating on the first and second wireless networks. Indeed, this configuration is effectively identical to what is disclosed in the '495 Patent with respect to Figure 4, an annotated version of which is reproduced below, in which a single "controller" includes an interface for communication via both the first and second wireless networks, yet still permits control of building components on the first wireless network in response to sensors on the first wireless network, free of communications with the second wireless network.



Annotated version of '495 Patent Figure 4 showing a block diagram of a single controller which includes both a transmitter/receiver interface for communication with a first wireless network (indicated by the line highlighted in green), as well as a transmitter/receiver interface for communication with a second wireless network (indicated by the line highlighted in pink)

1101. Thus, all communication and building control executed in the system of Herrmann that does not require communication between different cluster heads or a panel, satisfies the limitations of "the first wireless network operable to control, free of communications with the second wireless network, building components in response to sensors operable within the first wireless network,"

recited by claim 1[c]. Furthermore, as described in the context of multiple embodiments below, Herrmann discloses that the sensor/actuator node (i.e., the claimed "first wireless network") is operable to control building components in response to data from other cluster heads and/or panels (i.e., the claimed "second network").

1102. Herrmann discloses "[f]or example, the microcontroller of the cluster heads may run several software programs to coordinate the communication with other cluster heads (as may be required, for example, by the clusterhead network), to control the sensor/actuator network, and to interpret and store information retrieved from sensors and other cluster heads (database)" (*Id*., [0028]). Thus, while control of the sensor/actuator nodes may occur strictly within the first wireless network, such control may also be coordinated in accord with information from other cluster heads, and thus, in response to data from the second wireless network.

1103. Herrmann discloses at least one panel may be connected to a cluster head, and thus the second network, and that "[t]his may be accomplished, for example, via a Local Area Network (LAN), a direct Ethernet connection, another wire-based link, or a wireless link (*Id*., [0038]). Herrmann explains a panel "may also provide a gateway to an outside network or to an operator. Moreover, a person carrying a mobile or handheld computer may link with any of the cluster heads in his or her vicinity via a wireless connection. Hence, the network may be controlled from virtually any location within the communication range of the cluster heads" (*Id*., [0072]).

1104. Furthermore, Herrmann discloses "[t]he cluster heads may exchange and update the information about all registered nodes among each other. Hence, the complete topology of the sensor/actuator network may be derived at each individual cluster head." (*Id*., [0060], see also, [0052]). That is, information within a particular cluster head may be shared with one or more other cluster heads. This functionality may be used for different purposes, including the ability to map

out "the global routing topology for the entire sensor/actuator network" (*Id*., [0065]). Communication between cluster heads may also be used for purposes of information redundancy, for example, "in order to confirm messages" about a given sensor/actuator node (*see*, [0070]).

1105. Embodiments disclosed by Herrmann also address solutions to problems presented by sensor/actuator node failures. For instance, Herrmann explains "[i]n case of a failure of individual nodes or links in the sensor/actuator network, the network may reconfigure without user intervention so that link to all operable nodes of the remaining network may be re-established" (*Id*., [0081]). Herrmann discloses an approach wherein "**the cluster heads may provide disconnected sensor/actuator nodes with a new route** chosen from the list of all possible routes maintained at the cluster heads" (*Id*., [0083]).

1106. Thus, Herrmann discloses that data may be sent between different cluster heads on the second wireless network to achieve building control. This data may include information for reconfiguring communications routes among nodes of the sensor/actuator network, and it may also include information related to sensor and actuator conditions. Herrmann further discloses data communications from the panels can be used for control purposes related to the sensor/actuator network.

1107. Thus, it is my opinion that the disclosures of Herrmann would have disclosed or rendered obvious to a POSITA the limitations of a building automation control system wherein a "first wireless network is operable to control, free of communications with the second wireless network, building components in response to sensors operable within the first wireless network, and wherein the first wireless network is also operable to control the building components in response to data from the second wireless network," as recited by claim element 1[c]. Therefore, for at least the

reasons detailed above, it is my opinion that each and every limitation of claim 1 of the ’495 Patent is disclosed or rendered obvious by Herrmann with the general knowledge of a POSITA.

ii.Claim 2

1108. Claim 2 of the ’495 Patent recites:

> The control system of claim 1 wherein the first wireless communications protocol has a first bandwidth and the second wireless communications protocol has a second bandwidth, the first bandwidth less than the second bandwidth.

1109. Claim 2 of the ’495 Patent depends upon claim 1, and places additional limitations pertaining to the first and second wireless communications protocols. In particular, claim 2 requires that the bandwidth of the first wireless communications protocol is less than the bandwidth of the second wireless communications protocol. For at least the reasons detailed above in relation to Claim 1, it is my opinion that the disclosures of Herrmann render obvious to a POSITA the limitations of Claim 1. Furthermore, as explained below, it is my opinion that each and every limitation added to Claim 1 of the ’495 Patent by Claim 2 is also rendered obvious to a POSITA in view of Herrmann.

1110. In particular, Herrmann explains that cluster heads may “include a short or medium range radio module (‘Radio 1’) for communication with the sensor/actuator nodes” (Herrmann, [0026]). As detailed above with respect to claim 1, the sensor/actuator network of sensor nodes, actuator nodes, and a cluster head, constitutes a first wireless network having a first wireless communications protocol, operable to communicate via Radio 1.

1111. Furthermore, Herrmann discloses a second wireless network of cluster heads (and a panel) operable to communicate via Radio 2, stating “[f]or communication with other cluster heads, cluster heads may in addition include a second RF transceiver (‘Radio 2’) **with a larger**

bandwidth and/or longer communication range, such as, for example, but not necessarily at another frequency band than the Radio 1."

1112. Therefore, Herrmann discloses "the first bandwidth less than the second bandwidth," as required by claim 2. Consequently, for at least the reasons presented here, it is my opinion that Claim 2 of the '495 Patent is either disclosed or rendered obvious by Herrmann with the knowledge of a POSITA.

E. Claim 1 of the '495 Patent Is Obvious to a POSITA in view of Pasternak

1113. Asserted Claim 1 of the '495 Patent are invalid in view of Pasternak as prior art. As detailed below, it is my opinion that every limitation of the asserted claim would be obvious to a POSITA from the referenced prior art teachings and the knowledge of a skilled artisan.

i. Claim 1

1114. Claim 1 of the '495 Patent recites:

> A control system for wireless building automation control, the control system comprising:
>
> a first wireless network in a building having first wireless communications protocol; and
>
> a second wireless network in the building having a second wireless communications protocol, the first wireless communications protocol different than the second wireless communications protocol;
>
> wherein the first wireless network is operable to control, free of communications with the second wireless network, building components in response to sensors operable within the first wireless network, and wherein the first wireless network is also operable to control the building components in response to data from the second wireless network.

1115. Claim 1 of the '495 Patent claims a control system for a wireless building automation control system comprising both a first and a second wireless network, respectively communicating via a first and a second wireless communications protocol, wherein the first wireless network is

operable to control building components in response to sensors in the first wireless network, and that it may do so free of communications with the second wireless network, and further, wherein the first wireless network is also operable to control the building components in response to data from the second wireless network.

1116. As detailed in an element-by-element analysis below, every limitation of Claim 1 is disclosed, or at least rendered obvious to a POSITA in view of Pasternak.

a. **1[pre] A control system for wireless building automation control, the control system comprising:**

1117. To the extent that the preamble is limiting, Pasternak discloses a control system for wireless building automation control, as described below.

1118. Pasternak discloses a "control system for allowing remote control of a load" comprising a command controller configured to communicate with one or more remote controllers via one wireless network, wherein a remote controller is configured to communication with one or more loads via another wireless network (Pasternak, [0004], see also, e.g., [0011]-[0016]). Thus, Pasternak discloses a wireless control system.

1119. Furthermore, Pasternak explains that the disclosed invention is directed to a solution for remotely controlling and or monitoring devices (Pasternak, [0003]). Monitoring and controlling lighting in an office building is provided as an exemplary scenario in which the invention is applicable (*Id*.). Pasternak contemplates applications for its system including "tracking building occupancy or for security purposes such as identifying undesired occupants" (*Id.,* [0022]). Further, the control signals which the system sends may include "fields identifying a company, building, floor, zone, and load or fixture along with the information identifying the particular control action selected by user" (*Id.,* [0036]). A POSITA would understand from these examples and others given

in the specification (*e.g., Id.,* [0003], [0040], [0042], [0044], [0048]) that the wireless control system of Pasternak can be used for building automation.

1120. Thus, for at least the reasons detailed above, Pasternak discloses "[a] control system for wireless building automation control," as required by the preamble of claim 1 of the '495 patent, to the extent the preamble is determined to be limiting.

b. **1[a] a first wireless network in a building having first wireless communications protocol; and**

1121. The limitations of claim element 1[a] of the '495 Patent are disclosed by Pasternak for at least the reasons detailed below.

1122. In the context of Pasternak's Figure 1, reproduced below, depicting a block diagram of an exemplary lighting control system, Pasternak explains "[t]he command controller 102 bidirectionally communicates with the remote lighting systems 106 via a communications medium 108" (Pasternak, [0012]).

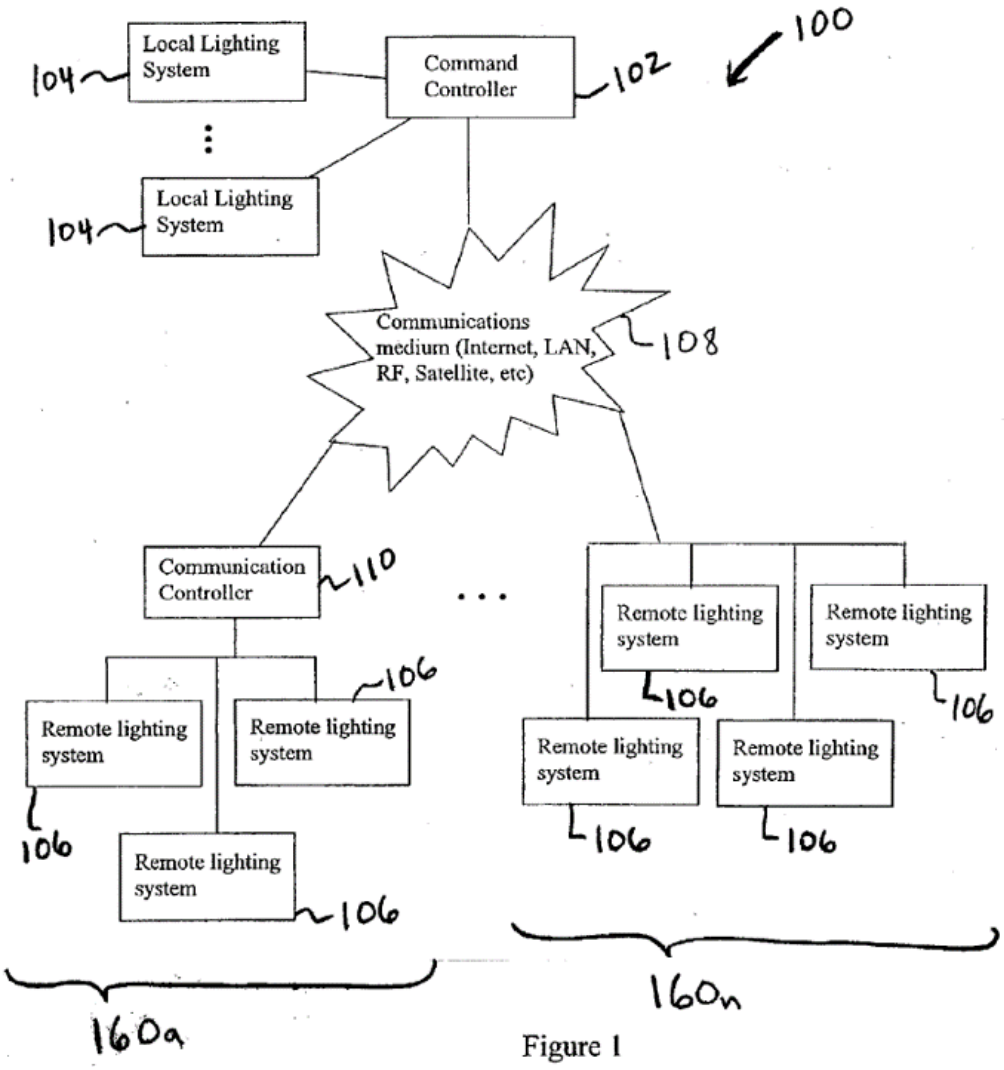


Figure 1 of Pasternak showing a partial block diagram of an exemplary lighting control system.

1123. With respect to Figure 1, Pasternak states that "the lighting control system 100 may include a communication controller 110 as a physical layer interface between the communications medium 108 and the remote lighting systems 106" (Pasternak, [0014]), but the system may be configured such that "each remote lighting system 106…may include its own interface to such communications medium 108 for directly communication with the command controller 102" (*Id*.). In other words, the Communications Controller 110 shown in Figure 1 of Pasternak may be

incorporated into a given remote lighting system 106. Such a configuration of a remote lighting system is depicted in Figure 2 of Pasternak, reproduced below.

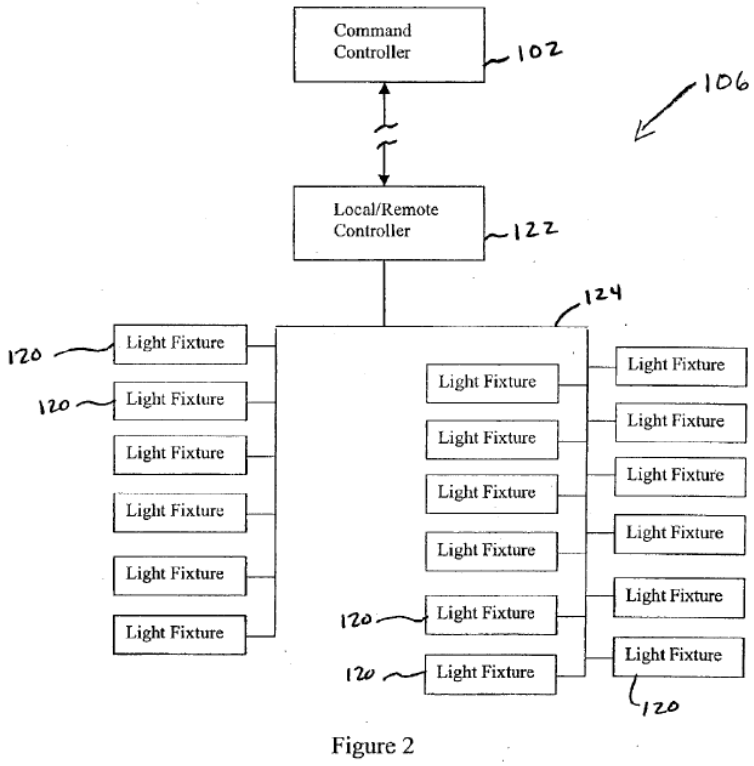


Figure 2 from Pasternak showing a block diagram of an exemplary remote lighting system.

1124. With respect to this embodiment, Pasternak describes that "[t]he remote lighting system 106 includes one or more separate and independently addressable light fixtures 120 that may be independently controlled by a local/remote controller 122 via a communication link 124" (Pasternak, [0016]). Pasternak expressly indicates the

> communication between the local/remote controller 122 and the light fixtures 120 may be via wired link (e.g., a building's power grid or a dedicated wired connection), wireless links (e.g., 802.11b links), or a combination thereof. The wired or wireless links to the light fixtures 120 may be direct point-to-point connections or networked connections (Pasternak, [0016]).

1125. The wireless network responsible for communication between the remote controller 122 and the light fixtures 120 constitutes the claimed "first wireless network in a building" as required by claim element 1[a].

1126. Figure 6 of Pasternak discloses another embodiment of Pasternak's control system – i.e., "exemplary control system 600" (Pasternak, [0031]), reproduced below. This system includes a command controller 120 configured to generate a command signal which is transmitted to a remote controller 122 via a wireless network" (*see*, Pasternak, [0031]). Remote controller 122 can then "adapt" that signal and "transmit[] the adapted command signal over another wireless network to a load controller 606 which controls a load 608 in response to the adapted command signal" (Pasternak, [0032]). Pasternak further describes that this wireless network "may be a radio frequency (RF) or short-range wireless network such as an 802.11 network for communicating with loads 608 that are in a region local to the remote controller 122" (Pasternak, [0038]).

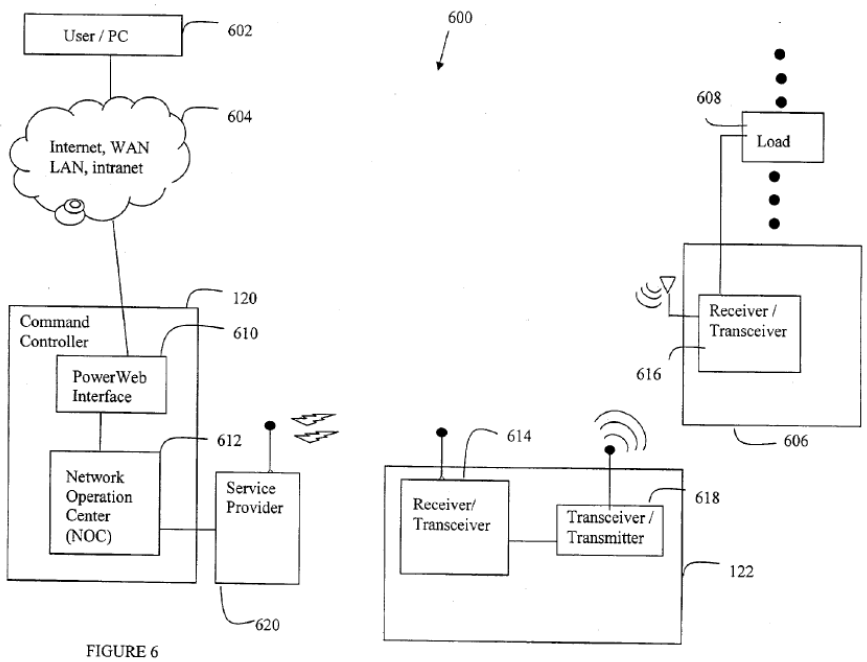


Fig. 6 from Pasternak showing a block diagram of an exemplary control system with at least two wireless communication networks.

1127. In this embodiment, the wireless network responsible for communication between the remote controller 122 and the load controller 606 constitutes the claimed "first wireless network in a building" as required by claim element 1[a].

1128. Additionally, a POSITA would have understood that the "wireless links" (Pasternak, [0016]) establishing communication among components of a network, must necessarily transmit and receive information according to a communication protocol. Protocols are generally established rules by which information is communicated, multiple of which would have been well known by a POSITA. By communicating over a particular protocol, a receiving component on a network will be configured to properly interpret the message sent by a transmitting component on the same network. Thus, Pasternak discloses to a POSITA "a first wireless network in a building having first wireless communications protocol" as required by claim element 1[a].

1129. Thus, for at least the reasons detailed above, Pasternak discloses a building automation control system comprising "a first wireless network in a building," and that said first wireless network has (i.e., communicates via a) "first wireless communications protocol," as recited by claim element 1[a]. Therefore, Pasternak discloses the limitations of claim element 1[a] of the '495 patent.

c. **1[b] a second wireless network in the building having a second wireless communications protocol, the first wireless communications protocol different than the second wireless communications protocol;**

1130. The limitations of claim element 1[b] of the '495 Patent are disclosed by Pasternak for at least the reasons detailed below.

1131. As discussed in claim element 1[a], Pasternak discloses a remote controller 122 that wirelessly communicates with individual light fixtures 120 (as described with respect to the embodiment shown in Pasternak's Figure 2, reproduced above as Figure 25 or that communicates

with the load controller 606 (as described with respect to the embodiment shown in Pasternak's Figure 6, reproduced above as Figure 24), both of which represent communication via the claimed "first wireless network."

1132. With respect to the embodiment in Pasternak's figure 1, Pasternak discloses "[t]he command controller 102 bidirectionally communicates with the remote lighting systems 106 via a communications medium 108. The communications medium 108 links the command controller 102 to the remote lighting systems 106 via one or more communication mediums including the Internet, local area networks (LANs), virtual local area networks (VLANs), **radio frequency (RF) links, satellite links**, optical links, etc. and combinations thereof" (Pasternak, [0012], emphasis added). Thus, Pasternak discloses many types of wireless networks within its specification.

1133. The wireless network responsible for communication between the command controller 102 and remote lighting systems (or Communication Controller 110, as shown in Pasternak's figure 1), constitutes the claimed "second wireless network in a building" as required by claim element 1[b]. Similarly, with respect to the embodiment in Pasternak's figure 6, Pasternak discloses a command signal from the command controller 120 is communicated to a remote controller 122 via a wireless network through interface 614 (see, Pasternak, [0031], [0032]).

1134. Pasternak explains

> [t]he wireless communication between the command controller 120 and the remote controller 122 may be **via one or more wireless communication technologies**, including a GSM (global System for mobile communication), GPRS (general packet radio service), 1XRTT (wireless air interface standard), SMS (short message Service) or a pager network. In an exemplary embodiment, the wireless communication between the command controller 120 and the remote controller 122 is in a bandwidth between 900 and 2400 MHZ (Pasternak, [0038])

1135. A POSITA would have understood that each of these to be an example of a wireless network technology that would adhere to a particular communication protocol, and that different wireless communication network technologies may be optimally configured to operate with different protocols for transferring information between components. Thus, Pasternak discloses "a second wireless network in the building having a second wireless communications protocol" as required by claim element 1[b].

1136. Furthermore, with respect to the same embodiment (i.e., Figure 6 of Pasternak), Pasternak indicates "[t]he system 600 combines short range and long range wireless communication networks for communicating command signals from a command controller 120 to control a load" (Pasternak, [0031]). In other words, the command controller and the remote controller may communicate via a long range wireless communication network, while the remote controller and load controller, or lighting fixtures, may communicate via a short range wireless communication network. Pasternak expressly contemplates that the communication network interconnecting the remote controller 122 and the load controllers 606 might may comprise "a short range wireless communication network such as an 802.11 network for communicating with loads 608 that are in the region local to the remote controller 122" (Pasternak, [0038]). Thus, the exemplary wireless network technologies that may be suitable for the two wireless networks disclosed by Pasternak are not the same (see, Pasternak, [0012], [0037], [0038]). Therefore, Pasternak discloses "the first wireless communications protocol different than the second wireless communications protocol" as required by claim element 1[b].

1137. Moreover, it would have been well-known to a POSITA that a wireless network employed for short range communications and a wireless network employed for long range communications may necessitate wireless communication technologies and associated protocols that would not be

suitable for both ranges, and, thus, said POSITA would have sought to use different wireless networks and respective associated protocols for the short range network (interconnecting, for example, the remote controller and load controller) and for the long range network (interconnecting the command controller and remote controller). Put another way, a POSITA would have understood that some of the wireless network mediums or technologies suggested by Pasternak for communication over longer ranges, would not be suitable for the communication over shorter distances, and thus two different wireless networks would be used.

1138. Further, Pasternak discloses that the remote controller 122 "adapts the command signal" received from the command controller, over the long range network, such that it can be communicated to the load controller over the short range network (Pasternak, [0032]). A POSITA would have understood from this that the protocols of the two networks are different, thereby necessitating the need to adapt the command signal between networks.

1139. A POSITA would further understand that for the system to enact automation of a building (see claim 1[pre]) via a short range protocol, at least the remote controller 122 would need to be "in the building" as stated by the claim language.

1140. Thus, Pasternak discloses a building automation control system comprising both a first wireless network having a first wireless communications protocol as well as a second wireless network having a second wireless communications protocol, wherein the first wireless communications protocol is different than the second wireless communications protocol. Therefore, Pasternak discloses the limitations of claim element 1[b] of the '495 Patent.

d. **1[c] wherein the first wireless network is operable to control, free of communications with the second wireless network, building components in response to sensors operable within the first wireless network, and wherein the first wireless network is also operable to control the building components in response to data from the second wireless network.**

1141. The limitations of claim element 1[c] of the '495 Patent are disclosed by Pasternak for at least the reasons detailed below.

1142. As an initial matter, I understand that the Court has ruled that the claim term "free of communications with the second wireless network" is to have its plain and ordinary meaning. I have adopted this meaning throughout my analysis.

1143. With respect to the embodiment shown in Figure 2, Pasternak describes that "[t]he remote lighting system 106 includes one or more separate and independently addressable light fixtures 120 that may be independently controlled by a local/remote controller 122 via a communication link 124" (Pasternak, [0016]). Pasternak further states "[t]he wired or wireless links to the light fixtures 120 may be direct point-to-point connections or networked connections (*Id*.).

1144. In this scenario, Pasternak describes an embodiment wherein building components (i.e., the light fixtures) are controlled by the first wireless network, free of communications with the second wireless network. As explained above with respect to claim element 1[a], the remote controller 122 and the light fixtures 120 together communicate over the claimed first wireless network. Additionally, because Pasternak describes this operation as occurring independently, it does not require communication from the command controller, and thus is operable to execute its control "free of communications with the second wireless network," as required by claim element 1[c]. Moreover, as shown in Figure 4 of Pasternak, reproduced below, Pasternak discloses embodiments of an exemplary light fixture that "selectively operates (on/off/dim/brighten/flash) the lamp 142 in response to signals received not only from the remote controller 143 and the light

Switch 148, but also from a motion sensor 145 and a photo sensor 147" (Pasternak, [0021]). Therefore, the first wireless network is operable to control the light fixtures "in response to sensors operable within the first wireless network," as required by claim element 1[c].

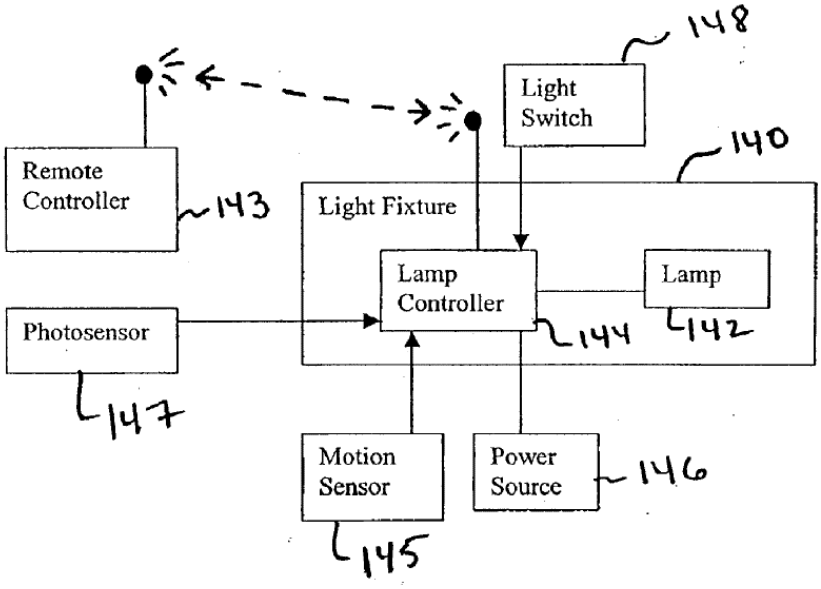


Figure 4 of Pasternak showing an embodiment of a lamp fixture 140 in wireless communication with a remote controller 143 (via dashed line), and responsive to a sensor 147.

1145. Pasternak states "[i]n the embodiment illustrated in FIG. 4, the bi-directional signaling between the remote controller 143 and the lamp controller 144 is via a wireless communications medium" (Pasternak, [0029]). With respect to this embodiment, Pasternak discloses that although the sensor 147 is "illustrated as communicating with the lamp controller 144, [it] may instead be coupled to the remote controller 143 (via wired or wireless connection) and the remote controller 143 may signal the lamp controller 144 to control the lamp 142 accordingly" (*Id.*). What Pasternak describes is communication entirely within the claimed first wireless network.

1146. A similar embodiment is shown in Figure 5 of Pasternak, as reproduced below.

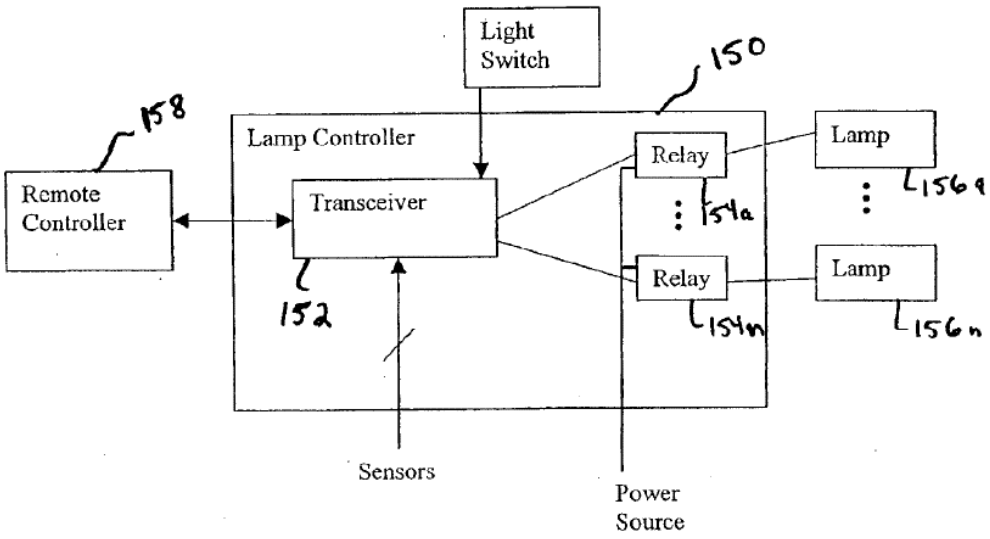


Figure 5 of Pasternak showing an embodiment of a lamp fixture, configured to receive input from sensors and communicate sensor information to a remote controller 158, which may subsequently generate a command signal for the lamp controller to control the lamps 156a-156n.

1147. With respect to the embodiment is shown in Figure 5, Pasternak explains that "[a]ll signals received from the sensors or the light switches are received by the lamp controller 150 and then transmitted to the remote controller 158. The remote controller 158 **or** the command controller 102 then processes the received signal and generates a command signal that it transmits to the transceiver 152, the command signal including information indicating how to control one or more of the lamps 156" (Pasternak, [0030]). In the case that the remote controller 158 processes the received signal and generates a command signal, in accordance with this embodiment, then the claimed second wireless network is does not participate in the communication or data exchange operable for controlling the lamp. In this case, Pasternak discloses an embodiment wherein "the first wireless network is operable to control, free of communications with the second wireless network, building components in response to sensors operable within the first wireless network," as required by claim element 1[c].

1148. With respect to the same embodiment of Pasternak's Figure 5, in the case that the command controller 102 processes the received signal and generates a command signal, then the lamp fixture,

on the first wireless network, is operated in response to data from the command controller, which is on the second wireless network. In this case, Pasternak discloses an embodiment wherein "the first wireless network is also operable to control the building components in response to data from the second wireless network," as further required by claim element 1[c].

1149. Thus, for at least the reasons described above it is my opinion that the disclosures of Pasternak would have disclosed or rendered obvious to a POSITA the limitations of claim element 1[c] of the '495 Patent.

1150. Therefore, for at least the reasons detailed above, it is my opinion that each and every limitation of claim 1 of the '495 Patent is disclosed or rendered obvious by Pasternak with the general knowledge of a POSITA.

F. Claim 2 of the '495 Patent Is Obvious to a POSITA in view of Pasternak in combination with Herrmann

1151. Asserted Claims 2 of the '495 Patent is invalid in view of Pasternak and Herrmann as prior art. As detailed below, it is my opinion that every limitation of the asserted claims would be obvious to a POSITA from the referenced prior art teachings and the knowledge of a skilled artisan.

i. Motivation to combine Pasternak with Herrmann

1152. It is my opinion that a POSITA looking to the teachings of Pasternak would have additionally looked to the teaching of Herrmann and been motivated to combine these prior art references for the reasons detailed below, and by doing so, would have arrived independently at a system that satisfies each and every limitation of claim 2 of the '495 Patent.

1153. As detailed in Sections V.G and V.H, Pasternak and Herrmann, respectively, disclose control systems with a multi-tiered network architecture comprising at least two wireless network layers. The lower level networks are both disclosed as being able to operate independently of higher level networks, or in response to data from those networks. Both patents further disclose

that these control systems can be used to interface with sensors, the output of which is taken into account to control actuators or loads. Both prior art references are directed toward enabling automated control of the external world with these various components in a hierarchical system. Both prior art references describe similar methods of communication such as Internet, local area networks (LAN), and radio frequency (RF). Thus, both Pasternak and Herrmann are within the same field of endeavor and are addressing similar problems with similar approaches (see e.g., Pasternak, Abstract, [0011]-[0014], [0018]-[0021], Figs. 1-4; and Herrmann, Abstract, [0007]-[0010], [0026]-[0028], Figs.1-2).

1154. Pasternak discloses a system with two wireless networks using two different protocols wherein the first network can control building components independently or in response to data from the second network. In particular, Pasternak discloses an exemplary embodiment in which "[t]he system 600 combines short range and long range wireless communication networks for communicating command signals from a command controller 120 to control a load 156" (Pasternak, [0031]). Pasternak also discusses an embodiment in which "[t]he lighting system may be used to maintain power consumption below a certain level" and that the system may be organized in a hierarchy of levels with the intention of conserving energy (Pasternak, *see* [0045]). As described above with respect to claim elements 1[a] - 1[c], a POSITA would have understood that the first and second wireless networks disclosed by Pasternak would necessarily communicate via a first and second wireless network protocol, and further, that said first and second network protocols are different from one another.

1155. A POSITA would have understood that wireless communications networks have a property known as "bandwidth," which is a quantity corresponding to a range of frequencies that is indicative of (or relates to) the data transfer rate or capacity to transfer data of a network. For

example, Pasternak explains "[i]n an exemplar embodiment, the wireless communication between the command controller 120 and the remote controller 122 is in a bandwidth between 900 and 2400 MHz" (Pasternak, [0037]). A POSITA would have understood that different networks may have different bandwidths and those bandwidths are determined by a number of factors including the protocol being used by the network, wireless reception capacity, power requirements, and the hardware used by the components on the network. Thus, said POSITA would have also understood that Pasternak's different first and second wireless network protocols would have different respective bandwidths.

1156. Although, Pasternak does not provide explicit disclosures with regard to how the relative size of these bandwidths should be configured within the first and second wireless networks, this information would have been common knowledge to a POSITA and is explicitly taught by Herrmann. First, a POSITA would have understood that generally networks with components separated by relatively short distances, configured to communicate less information with less power available would require less bandwidth than networks with components separated by longer distances, communicating more information with more power available. Second, Herrmann expressly discloses how the respective bandwidths of Pasternak's system should be configured, as described below.

1157. In Herrmann's exemplary embodiment shown in Figure 2, the nodes of the sensor/actuator network are comparatively less powerful, and may be battery-powered (see, e.g., Herrmann, [0024]), while the clusterheads, for example "may not be as limited in energy resources" (Herrmann, [0026]). Herrmann's disclosed hierarchical wireless network arrangement of interconnected components is configured to impose "less severe energy constraints upon the network" (Herrmann, [0008]). More specifically, Herrmann discloses "[c]luster heads may further

include a short or medium range radio module ("Radio 1") for communication with the sensor/actuator nodes" (Herrmann, [0026]). which may be "battery-powered devices with short-range wireless transceivers" (Herrmann, [0013]). "For communication with other cluster heads, cluster heads may in addition include a second RF transceiver ("Radio 2") with a larger bandwidth and/or longer communication range, Such as, for example, but not necessarily at another frequency band than the Radio 1." (Herrmann, [0026]). Thus, Herrmann teaches that the short range wireless network with a lower level of energy resources should be configured to operate with a lower bandwidth compared to the longer range wireless network. Conversely, Herrmann teaches the use of a larger wireless network bandwidth, allowing for greater information communication capacity or rate, when more power resources are available.

1158. A POSITA seeking to implement Pasternak's "short range and long range wireless communication networks for communicating command signals from a command controller 120 to control a load 156" (Pasternak, [0031]), would have looked to the teachings of Herrmann which would have provided the information missing from Pasternak as to precisely which wireless network should be configured with the larger bandwidth. Moreover, the embodiment comprising the specific combination of the two prior art references a POSITA would have been motivated to make would enable a system comprising at least a short and long range communications network to be properly optimized with respect to available energy resources. This combination would further enable a version of Pasternak's lighting control system, comprising two different wireless networks, with a means of improving the relative capacities and managing signal load of the disclosed networks.

1159. A POSITA would have been found it obvious to use the disclosures of Herrmann to ensure an optimally configured system of Pasternak since the use of two different bandwidths for the two

respective wireless networks would not have required significant design changes or further engineering. Rather, the combination would merely have informed a POSITA's decision making with respect to selecting network configuration parameters needed for establishing the respective networks.

1160. A POSITA would have recognized that the disclosures of Pasternak and Herrmann are compatible with each other and would be able to implement the above-described combination of features without undue experimentation to achieve predictable results. A POSITA further would have had a reasonable expectation of success utilizing the teaching of Pasternak with minor input from Hermann regarding network configuration in the case where the second, higher level network is managing larger amounts of information and/or managing information at higher rates. Any such configuration would have been within the skill of a POSITA.

ii.Claim 2

1161. Claim 2 of the '495 Patent recites:

> The control system of claim 1 wherein the first wireless communications protocol has a first bandwidth and the second wireless communications protocol has a second bandwidth, the first bandwidth less than the second bandwidth.

1162. Claim 2 of the '495 Patent depends upon claim 1, and places additional limitations pertaining to the first and second wireless communications protocols. In particular, claim 2 requires that the bandwidth of the first wireless communications protocol is less than the bandwidth of the second wireless communications protocol. For at least the reasons detailed above in relation to Claim 1, it is my opinion that the disclosures of Pasternak render obvious to a POSITA the limitations of Claim 1. Furthermore, as explained below, it is my opinion that each and every limitation added to Claim 1 of the '495 Patent by Claim 2 is also rendered obvious to a POSITA in view of Pasternak combined with Herrmann.

1163. As described above with respect to claim element 1[b], Pasternak discloses a command controller and one or more remote controllers that may communicate via a long range wireless communication network, while a given remote controller and load controller, or lighting fixtures, may communicate via a short range wireless communication network.

1164. It would have been well-known to a POSITA that a wireless network employed for short range communications between relatively simple, low-power devices would require less bandwidth than a wireless network employed for long range communications between more complicated controllers. A POSITA would have also understood that the differences among the respective first and second wireless protocols would include differences in physical characteristics of the associated communication signals, including bandwidth.

1165. Thus, the disclosures of Pasternak would have rendered obvious to a POSITA that the first and second wireless communications protocol could comprise first and second bandwidths, respectively, that are not the same. Moreover, the disclosures of Pasternak would have rendered obvious to a POSITA that the first bandwidth, associated with the short range wireless network within a given remote lighting system, would be less than the second bandwidth of Pasternak's communication medium interconnecting a command controller and one or more remote lighting systems, and therefore the limitations of claim 2 of the '495 Patent are rendered obvious by Pasternak.

1166. However, even to the extent it is determined that Pasternak would not have rendered obvious to a POSITA that the first wireless communications protocol has a first bandwidth different (and less than) the bandwidth of the second wireless communications protocol, as required by claim 2, these limitations are disclosed by Herrmann.

1167. Herrmann discloses a "network [that] may include two physical portions or layers" (Herrmann, [0008]). One physical layer described by Herrmann includes a sensor/actuator network comprising sensor nodes, actuator nodes, and a cluster head. Herrmann's "sensor/actuator network" (*Id*., [0028]), comprising sensor and actuator nodes capable of communicating both among themselves and with a cluster head, discloses a "first wireless network in a building," as required by claim element 1[a]. Herrmann explains that cluster heads may "include a short or medium range radio module ('Radio 1') for communication with the sensor/actuator nodes" (Herrmann, [0026]). The sensor/actuator network of sensor nodes, actuator nodes, and a cluster head, constitutes a first wireless network having a first wireless communications protocol, operable to communicate via Radio 1.

1168. A second physical layer described by Herrmann includes a wireless network of cluster heads (and a panel) operable to communicate via Radio 2, stating "[f]or communication with other cluster heads, cluster heads may in addition include a second RF transceiver ('Radio 2') **with a larger bandwidth** and/or longer communication range, such as, for example, but not necessarily at another frequency band than the Radio 1." Therefore, Herrmann discloses "the first bandwidth less than the second bandwidth," as required by claim 2. Therefore, Herrmann discloses the limitations of claim 2 of the '495 Patent.

1169. As explained above in Section VIII.F.i, a POSITA seeking to implement Pasternak's "short range and long range wireless communication networks for communicating command signals from a command controller 120 to control a load 156" (Pasternak, [0031]) would have known that the respective wireless communications networks would require two different bandwidth; however, said POSITA would have looked to the teachings of Herrmann to provide the information missing from Pasternak as to precisely which wireless network should be configured with the larger

bandwidth. Incorporating the teachings of Herrmann with regard to the application of relative bandwidth size for the respective wireless networks would enable a POSITA to further optimize the two-tiered network architecture, comprising both a first and a second wireless network, based upon factors such as relative distance ranges over which said wireless networks are intended to communicate, the type of protocol used, and resource (e.g., power) conservation.

1170. Therefore, Pasternak in combination with Herrmann discloses "the first bandwidth less than the second bandwidth," as required by claim 2. Consequently, for at least the reasons presented here, it is my opinion that Claim 2 of the '495 Patent is either disclosed by, or rendered obvious in view of, the specific combination of Pasternak and Herrmann that a POSITA would be motivated to make.

G. Claim 1 of the '495 Patent Is Obvious to a POSITA in view of Ahmed

1171. Asserted Claim 1 of the '495 Patent are invalid in view of Ahmed as prior art. As detailed below, it is my opinion that every limitation of the asserted claim would be obvious to a POSITA from the referenced prior art teachings and the knowledge of a skilled artisan.

i. Claim 1

1172. Claim 1 of the '495 Patent recites:

> A control system for wireless building automation control, the control system comprising:
>
> a first wireless network in a building having first wireless communications protocol; and
>
> a second wireless network in the building having a second wireless communications protocol, the first wireless communications protocol different than the second wireless communications protocol;
>
> wherein the first wireless network is operable to control, free of communications with the second wireless network, building components in response to sensors operable within the first wireless network, and wherein the first wireless network is also operable to

control the building components in response to data from the second wireless network.

1173. Claim 1 of the ’495 Patent claims a control system for a wireless building automation control system comprising both a first and a second wireless network, respectively communicating via a first and a second wireless communications protocol, wherein the first wireless network is operable to control building components in response to sensors in the first wireless network, and that it may do so free of communications with the second wireless network, and further, wherein the first wireless network is also operable to control the building components in response to data from the second wireless network.

1174. As detailed in an element-by-element analysis below, every limitation of Claim 1 is disclosed, or at least rendered obvious to a POSITA in view of Ahmed.

a. **1[pre] A control system for wireless building automation control, the control system comprising:**

1175. To the extent that the preamble is limiting, Ahmed discloses a control system for wireless building automation control, as described below.

1176. Ahmed discloses “a building control system that incorporates wireless communications” (Ahmed, [0009], see also *e.g.*, Abstract, [0006], [0008]-[0011]) which may be used for “building automation and/or safety sensing systems” (Ahmed, [0033], see also *e.g.*, [0087], [0098], [0103], [0112]).

1177. Thus, for at least the reasons detailed above, Ahmed discloses “[a] control system for wireless building automation control,” as required by the preamble of claim 1 of the ’495 Patent, to the extent the preamble is determined to be limiting.

b. **1[a] a first wireless network in a building having first wireless communications protocol; and**

1178. The limitations of claim element 1[a] of the ’495 Patent are disclosed by Ahmed for at least the reasons detailed below.

1179. Ahmed discloses an exemplary building control system 100, with respect to Figure 1 contained therein and reproduced below, comprising “ a supervisory computer 102, a wireless area network server 104, a chiller controller subsystem 106, a fan controller subsystem 108, and room controller subsystems 110, 112 and 114” (Ahmed, [0023]).

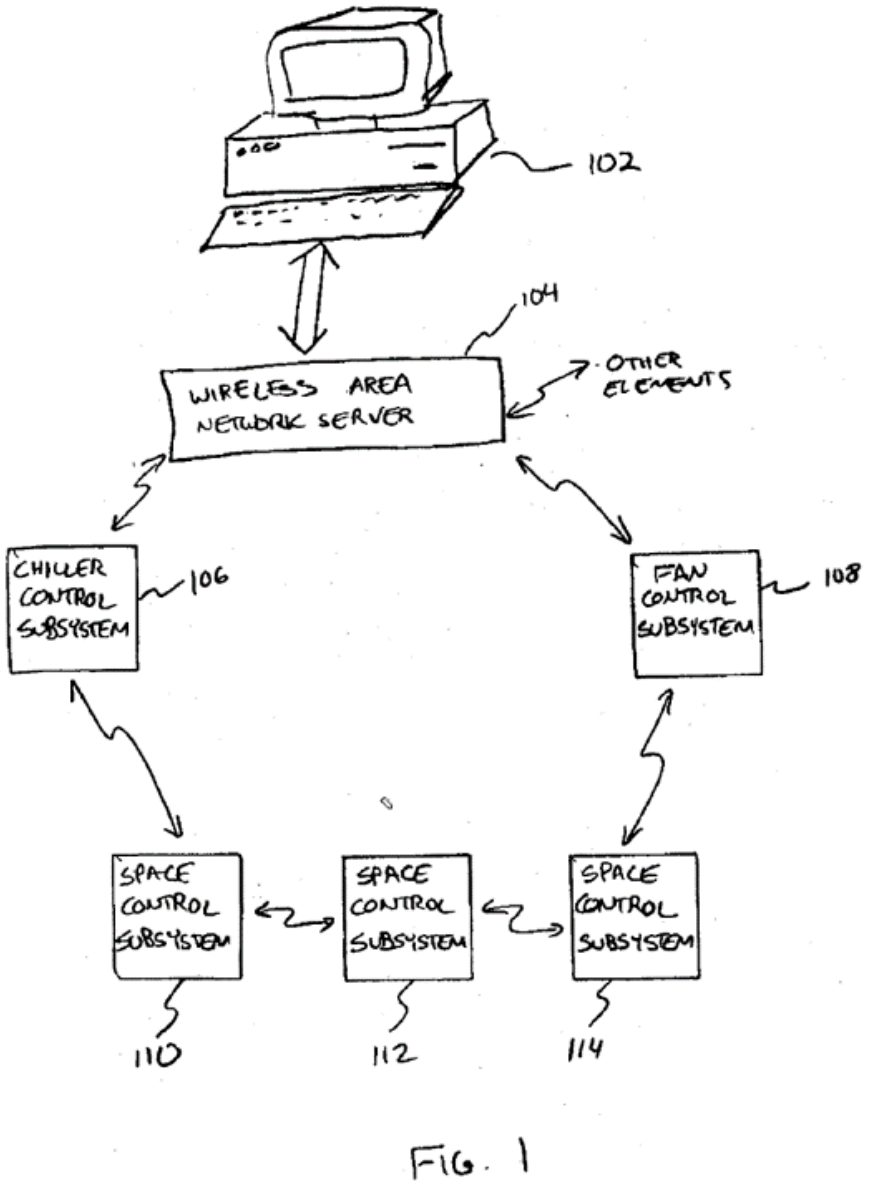


FIG. 1

Figure 1 of Ahmed showing a block diagram of an exemplary building control system.

1180. Ahmed discloses that "each of the space control subsystems 110, 112 and 114 has multiple elements," (Ahmed, [0028]), and that said elements within a given space control system are configured to communicate with each other using a "wireless communication scheme" (*Id.*). An exemplary space control subsystem 110 is shown in Figure 2 of Ahmed, reproduced below.

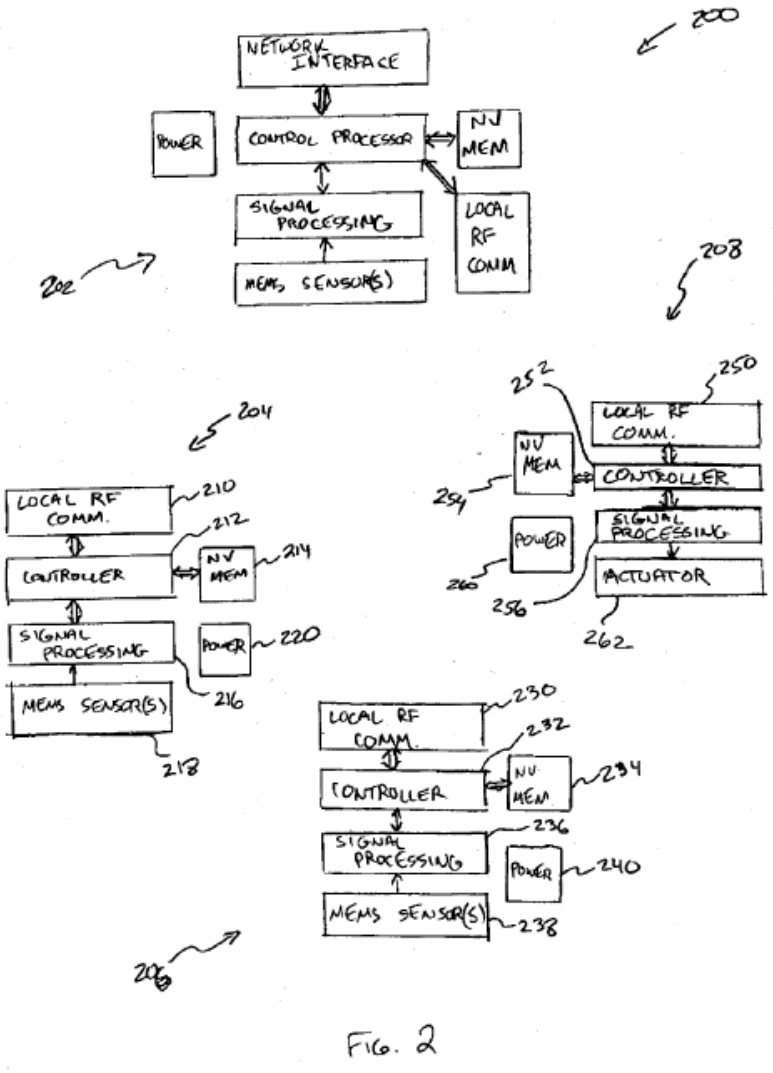


FIG. 2

Figure 2 of Ahmed showing a block diagram of the multiple elements within an exemplary space control subsystem, which is contained within the building control system.

1181. The space control subsystem 110 in Figure 2 of Ahmed "includes a bub module 202, first and second sensor modules 204 and 206, respectively, and an actuator module 208" (Ahmed, [0029]). The blocks identified as local RF communications circuits within each module of this embodiment (e.g., 220, 230, and 250), communicate according to the wireless communication scheme disclosed by Ahmed. A POSITA would understand such a subsystem sharing a communication scheme and central hub would constitute a network. Thus, the interconnected

modules within space control subsystem 110 communicating via the local RF communications circuits constitute a "first wireless network in a building" as required by claim element 1[a].

1182. Furthermore, Ahmed asserts "[a] wireless communication scheme identifies the specific protocols and RF frequency plan employed in wireless communications between sets of wireless devices" (Ahmed, [0024], emphasis added). Indeed, Ahmed explains that it is preferable for the wireless communication scheme between these elements to "employ a short-range or local RF communication scheme such as Bluetooth" (Ahmed, [0028], see also [0040]). Ahmed, therefore, provides an example of a preferred standardized protocol (*i.e.,* Bluetooth) for this wireless network. Therefore, Ahmed also discloses that the first wireless network has a "first wireless communications protocol," as required by claim element 1[a].

1183. Even without Ahmed's expressed indication that a specific communication protocol is identified by the wireless communication scheme, a POSITA would have understood that wireless communications between elements such as the ones described above would have required a protocol in order to transfer meaningful information. A POSITA would also have known that the choice of any given protocol would be based on the engineering constraints of the system (*e.g.*, component compatibility, power consumption).

1184. Thus, for at least the reasons detailed above, Ahmed discloses a building automation control system comprising "a first wireless network in a building," and that said first wireless network has (i.e., communicates via a) "first wireless communications protocol," as recited by claim element 1[a]. Therefore, Ahmed discloses the limitations of claim element 1[a] of the '495 patent.

c. **1[b] a second wireless network in the building having a second wireless communications protocol, the first wireless communications protocol different than the second wireless communications protocol;**

1185. The limitations of claim element 1[b] of the ’495 Patent are disclosed by Ahmed for at least the reasons detailed below.

1186. In addition to the “short-range or local RF communication scheme” (Ahmed, [0028]) disclosed by Ahmed, which, as detailed above with respect to claim element 1[a], constitutes the claimed first wireless network, Ahmed also discloses another wireless communication scheme “to effect communications between the supervisory computer 102, the chiller controller subsystem 106, the fan controller subsystem 108, and the room controller subsystems 110, 112 and 114” (Ahmed, [0024]). Figure 1 of Ahmed shows the elements of this network, as reproduced above in Figure 34. That is, Ahmed discloses a wireless network facilitating communication between modules of a given space control subsystem, which constitutes “a first wireless network in the building,” as required by claim element 1[a]. Ahmed also discloses a wireless network facilitating communication between the various subsystems indicated in Ahmed’s Figure 1 and a supervisory computer 102, which together constitutes “a second wireless network in the building,” a required by claim element 1[b].

1187. As indicated above with respect to claim element 1[a], Ahmed asserts “[a] wireless communication scheme identifies the specific protocols and RF frequency plan employed in wireless communications between sets of wireless devices” (Ahmed, [0024]). More specifically, Ahmed contemplates that the communications scheme interconnecting the space control subsystems and the supervisory computer be “implemented as a wireless area network. To this end, a wireless area network server 104 coupled to the supervisory computer 102 employs a packet-hopping wireless protocol to effect communication by and among the various subsystems of the

building control system 100" (Ahmed, [0024]). Thus, Ahmed discloses that this communication scheme facilitating communication between and among the supervisory computer and various subsystems constitutes "a second wireless network in the building having a second wireless communications protocol," as claim element 1[b] requires.

1188. A POSITA would understand that the devices configured for wireless communication with the supervisory computer and the set of components configured for wireless communication within a subsystem might adhere to different communication scheme and, consequently, to different protocols, at least in part because they are directed to different purposes. Ahmed contemplates that solutions to address drawbacks of building control systems of the prior art must account for "both local and overall control operations" (Ahmed, [0007]). The two wireless communication schemes disclosed by Ahmed are likewise directed to *local* control operations and *overall* control operations. It would have been well-known to a POSITA that a wireless network employed for short range communications and a wireless network employed for longer range communications may necessitate wireless communication networks and associated protocols that would not be suitable for both ranges, and, thus, said POSITA would have sought to use different wireless networks and respective associated protocols for the short range network (interconnecting, modules within a subsystem) and for the longer range network (interconnecting subsystems and the supervisory computer). Consequently, a POSITA would have understood that the two wireless communications protocols disclosed by Ahmed would be different from one another.

1189. Ahmed supports this by emphasizing different physical considerations corresponding to the two wireless communications schemes disclosed therein for the intra-subsystem and inter-subsystem communications. In particular, Ahmed states that messages on what constitutes the claimed second wireless network are preferably sent via a "packet-hopping protocol" wherein

messages are relayed via whichever intermediate subsystems are physically closest (Ahmed, [0055]). In contrast, Ahmed indicates that information exchanged on what constitutes the claimed first wireless network are preferably sent via "[t]he use of a MEMS-based RF communication circuit [which] allows for reduced power consumption, thereby enabling the potential use of a true wireless, battery operated sensor module 204" (Ahmed, [0040]), wherein said RF communications circuits "may suitably include a Bluetooth RF modem, or some other type of short range (about 30-100 feet) RF communication modem" (*Id.*). A POSITA would understand that these different wireless communication networks would be optimally suited for different wireless communication network protocols.

1190. Yet further, Ahmed discloses a network interface 270 which is a component of the hub module shown in Fig. 2 of the Ahmed (Ahmed, [0053]-[0055]). The purpose of this network interface is to "effectuate communication to one or more components of the building control system that are not a part of the space control subsystem 110" such as the supervisory computer 102 or other subsystems (Ahmed, [0054]). A POSITA would understand that the function of this device is effectively to translate and interpret message on the first network for the second network and vice versa. As such, a POSITA would further understand that such functionality is necessary when the protocols of the two networks differ.

1191. Thus, Ahmed discloses a building automation control system comprising both a first wireless network having a first wireless communications protocol as well as a second wireless network having a second wireless communications protocol, wherein the first wireless communications protocol is different than the second wireless communications protocol. Therefore, Ahmed discloses the limitations of claim element 1[b] of the '495 Patent.

d. **1[c] wherein the first wireless network is operable to control, free of communications with the second wireless network, building components in response to sensors operable within the first wireless network, and wherein the first wireless network is also operable to control the building components in response to data from the second wireless network.**

1192. The limitations of claim element 1[c] of the '495 Patent are disclosed by Ahmed for at least the reasons detailed below.

1193. As an initial matter, I understand that the Court has ruled that the claim term "free of communications with the second wireless network" is to have its plain and ordinary meaning. I have adopted this meaning throughout my analysis.

1194. Ahmed discloses that a space control subsystem, within which the claimed "a first wireless network" is contained, has "multiple elements that communicate with each other" (Ahmed, [0028]). These elements can include "a hub module 202, first and second sensor modules 204 and 206, respectively, and an actuator module 208" (Ahmed, [0029]). Ahmed further discloses that "the hub module 202 obtains process variable values (i.e. sensor information) from either or both of the sensor modules 204 and 206 and generates control output values" and that "[t]he hub module 202 provides the control output values to the actuator module 208" (Ahmed, [0051]). Accordingly, Ahmed discloses the hub module, which is within the first wireless network, receiving information from a sensor module and relaying control information to an actuator module, also within the first wireless network (see also, e.g., Ahmed, [0010], [0038], [0049]). Ahmed similarly discloses that the controller of the hub module "is operable to obtain the process value from the sensor module and provide a control output to the actuator module, the controller further operable to communicate with at least one of the sensor module and the actuator module using a wireless communication device" (Ahmed, [0010]), and further, that "[t]he controller is also connected to receive a set point

value, and is operable to generate the control output based on the process value and the set point value" (*Id*., *see* also Ahmed, [0051]).

1195. In this respect, Ahmed discloses that the hub module of the first network is operable to control actuators on the first network in response to sensors on the first network without any input or communications from the second network. That is, the space control subsystem in accordance with this set of operations does not include any communications with the supervisory computer or with other subsystems via the "network controller" in order to control local building components (i.e., within the space control subsystem) and therefore discloses a "first wireless network is operable to control, free of communications with the second wireless network, building components in response to sensors operable within the first wireless network." Thus, it is my opinion that the disclosures of Ahmed would have disclosed or rendered obvious to a POSITA the limitations of a building automation control system wherein a "first wireless network is operable to control, free of communications with the second wireless network, building components in response to sensors operable within the first wireless network," as recited by claim element 1[c].

1196. As discussed previously with respect to claim element 1[b], the hub module 202 containing network interface 270 and local RF communications circuit 280 serves as an interpreter between the first and second networks. As discussed above, Ahmed discloses that the setpoint for control of the actuators may be supplied directly on hub module 202. Ahmed also discloses that "the processor 272 [within hub module 202] obtains a set point through the network interface 270" (Ahmed, [0067]). Ahmed continues that "for example, the supervisory computer 102 of FIG. 1 may provide the temperature set points for all of the space control subsystems 110, 112 and 114 in the building control system 100" (Ahmed, [0067]). As discussed in claim element 1[b], the supervisory computer 102 sends data in the form of a setpoint to the space control subsystems via

the second network (see also Ahmed, [0024], [0061]). The space control subsystem then uses this setpoint to generate control signals for the actuators within the first network (Ahmed, [0051], [0061]). In this way, the first wireless network is operable to control building components (i.e., actuators) in response to data (i.e., setpoints) from the second network.

1197. Thus, it is my opinion that the disclosures of Ahmed would have disclosed or rendered obvious to a POSITA the limitations of a building automation control system wherein "the first wireless network is also operable to control the building components in response to data from the second wireless network," as recited by claim element 1[c]. Therefore, for at least the reasons detailed above, it is my opinion that each and every limitation of claim 1 of the '495 Patent is disclosed or rendered obvious by Ahmed with the general knowledge of a POSITA.

H. Claim 2 of the '495 Patent Is Obvious to a POSITA in view of Ahmed in combination with Herrmann

1198. Asserted Claims 2 of the '495 Patent is invalid in view of Ahmed and Herrmann as prior art. As detailed below, it is my opinion that every limitation of the asserted claims would be obvious to a POSITA from the referenced prior art teachings and the knowledge of a skilled artisan.

i. Motivation to combine Ahmed with Herrmann

1199. It is my opinion that a POSITA looking to the teachings of Ahmed would have additionally looked to the teaching of Herrmann and been motivated to combine these prior art references for the reasons detailed below, and by doing so, would have arrived independently at a system that satisfies each and every limitation of claim 2 of the '495 Patent.

1200. As detailed in Sections V.A and V.H, Ahmed and Herrmann, respectively, disclose control systems with a multi-tiered network architecture comprising at least two wireless network layers. The lower level networks are both disclosed as being able to operate independently of higher level networks, or in response to data from those networks. Both patents further disclose that these

control systems can be used to interface with sensors, the output of which is taken into account to control actuators. Both prior art references are directed toward enabling automated control of the external world with these various components in a hierarchical system. Both prior art references describe similar methods of communication such as Internet, local area networks (LAN), and radio frequency (RF). Thus, both Ahmed and Herrmann are within the same field of endeavor and are addressing similar problems with similar approaches (see e.g., Ahmed, Abstract, [0007]-[0011], [0023]-[0028], Figs. 1-4; Herrmann, Abstract, [0007]-[0010], [0026]-[0028], Figs. 1-2).

1201. Ahmed discloses a system with two wireless networks using two different protocols wherein the first network can control building components independently or in response to data from the second network. In particular, Ahmed discloses an exemplary embodiment in which one wireless network enables communications between a supervisory computer and one or more space control subsystems, another wireless network enables communication between elements within a given space control subsystem (Ahmed, [0024]), wherein it is preferable that this latter "communication scheme employ a short-range or local RF communication scheme such as Bluetooth." (Ahmed, [0028]) With respect to this latter wireless network in a subsystem, Ahmed explains, "[t]he use of a MEMS-based RF communication circuit allows for reduced power consumption, thereby enabling the potential use of a true wireless, battery operated sensor module 204." (Ahmed, [0040]).

1202. As described above with respect to claim elements 1[a] - 1[c], a POSITA would have understood that the first and second wireless networks disclosed by Ahmed would necessarily communicate via a first and second wireless network protocol, and further, that said first and second network protocols are different from one another.

1203. While not explicitly disclosed by Ahmed, a POSITA would have understood that wireless communications networks have a property known as "bandwidth," which is a quantity corresponding to a range of frequencies that is indicative of (or relates to) the data transfer rate or capacity to transfer data of a network. A POSITA would have understood that different networks may have different bandwidths and those bandwidths are determined by a number of factors including the protocol being used by the network, wireless reception capacity, power requirements, and the hardware used by the components on the network. Thus, said POSITA would have also understood that Ahmed's different first and second wireless network protocols would have different respective bandwidths.

1204. Although Ahmed does not provide explicit disclosures with regard to how the relative size of these bandwidths should be configured within the first and second wireless networks, this information would have been common knowledge to a POSITA and is explicitly taught by Herrmann. First, a POSITA would have understood that generally networks with components separated by relatively short distances, configured to communicate less information with less power available would require less bandwidth than networks with components separated by longer distances, communicating more information with more power available. Second, Herrmann expressly discloses how the respective bandwidths of Ahmed's system should be configured, as described below.

1205. In Herrmann's exemplary embodiment shown in Figure 2, the nodes of the sensor/actuator network are comparatively less powerful, and may be battery-powered (see, e.g., Herrmann, [0024]), while the clusterheads, for example "may not be as limited in energy resources" (Herrmann, [0026]). Herrmann's disclosed hierarchical wireless network arrangement of interconnected components is configured to impose "less severe energy constraints upon the

network" (Herrmann, [0008]). More specifically, Herrmann discloses "[c]luster heads may further include a short or medium range radio module ("Radio 1") for communication with the sensor/actuator nodes" (Herrmann, [0026]). which may be "battery-powered devices with short-range wireless transceivers" (Herrmann, [0013]). "For communication with other cluster heads, cluster heads may in addition include a second RF transceiver ("Radio 2") with a larger bandwidth and/or longer communication range, Such as, for example, but not necessarily at another frequency band than the Radio 1." (Herrmann, [0026]). Thus, Herrmann teaches that the short range wireless network with a lower level of energy resources should be configured to operate with a lower bandwidth compared to the longer range wireless network. Conversely, Herrmann teaches the use of a larger wireless network bandwidth, allowing for greater information communication capacity or rate, when more power resources are available.

1206. A POSITA seeking to implement Ahmed's wireless network between a supervisory computer and multiple subsystems together with Ahmed's short range wireless network interconnecting modules within each subsystem – and to do so using lower power (e.g., batter-powered) RF communication circuits (Ahmed, see, e.g., [0009], [0030], and [0040]) – would have looked to the teachings of Herrmann which would have provided the information missing from Ahmed as to precisely which wireless network should be configured with the larger bandwidth. Moreover, the embodiment comprising the specific combination of the two prior art references a POSITA would have been motivated to make would enable a system comprising "both [a] local and overall" communications network to be properly optimized with respect to available energy resources. This combination would further enable a version of Ahmed's wireless building control system, comprising two different wireless networks, with a means of improving the relative capacities and managing signal load of the disclosed networks.

1207. A POSITA would have been found it obvious to use the disclosures of Herrmann to ensure an optimally configured system of Ahmed since the use of two different bandwidths for the two respective wireless networks would not have required significant design changes or further engineering. Rather, the combination would merely have informed a POSITA's decision making with respect to selecting network configuration parameters needed for establishing the respective networks.

1208. A POSITA would have recognized that the disclosures of Ahmed and Herrmann are compatible with each other and would be able to implement the above-described combination of features without undue experimentation to achieve predictable results. A POSITA further would have had a reasonable expectation of success utilizing the teaching of Ahmed with minor input from Hermann regarding network configuration in the case where the second, higher level network is managing larger amounts of information and/or managing information at higher rates. Any such configuration would have been within the skill of a POSITA.

ii.Claim 2

1209. Claim 2 of the '495 Patent recites:

> The control system of claim 1 wherein the first wireless communications protocol has a first bandwidth and the second wireless communications protocol has a second bandwidth, the first bandwidth less than the second bandwidth.

1210. Claim 2 of the '495 Patent depends upon claim 1, and places additional limitations pertaining to the first and second wireless communications protocols. In particular, claim 2 requires that the bandwidth of the first wireless communications protocol is less than the bandwidth of the second wireless communications protocol. For at least the reasons detailed above in relation to Claim 1, it is my opinion that the disclosures of Ahmed render obvious to a POSITA the limitations of Claim 1. Furthermore, as explained below, it is my opinion that each and every

limitation added to Claim 1 of the ’495 Patent by Claim 2 is also rendered obvious to a POSITA in view of Ahmed combined with Herrmann.

1211. As described above with respect to claim element 1[b], Ahmed discloses a building control system in which “a wireless area network server 104 coupled to the supervisory computer 102 [that] employs a packet hopping wireless protocol to effect communication by and among the various subsystems of the building control system 100” (Ahmed, [0024]). Ahmed discloses its building control also includes short-range RF communication circuits for local wireless network communications between low-power components, or modules, within a subsystem.

1212. It would have been well-known to a POSITA that a wireless network employed for short range communications between relatively simple, low-power devices would require less bandwidth than a wireless network employed for long range communications between more complicated controllers. A POSITA would have also understood that the differences among the respective first and second wireless protocols would include differences in physical characteristics of the associated communication signals, including bandwidth.

1213. Thus, the disclosures of Ahmed would have rendered obvious to a POSITA that the first and second wireless communications protocol could comprise first and second bandwidths, respectively, that are not the same. Moreover, the disclosures of Ahmed would have rendered obvious to a POSITA that the first bandwidth, associated with the short range wireless network within a given space control subsystem, would be less than the second bandwidth of Ahmed’s communication network interconnecting a supervisory computer and one or more space control subsystems, and therefore the limitations of claim 2 of the ’495 Patent are rendered obvious by Ahmed.

1214. However, even to the extent it is determined that Ahmed would not have rendered obvious to a POSITA that the first wireless communications protocol has a first bandwidth different (and less than) the bandwidth of the second wireless communications protocol, as required by claim 2, these limitations are disclosed by Herrmann.

1215. Herrmann discloses a "network [that] may include two physical portions or layers" (Herrmann, [0008]). One physical layer described by Herrmann includes a sensor/actuator network comprising sensor nodes, actuator nodes, and a cluster head. Herrmann's "sensor/actuator network" (*Id*., [0028]), comprising sensor and actuator nodes capable of communicating both among themselves and with a cluster head, discloses a "first wireless network in a building," as required by claim element 1[a]. Herrmann explains that cluster heads may "include a short or medium range radio module ("Radio 1") for communication with the sensor/actuator nodes" (Herrmann, [0026]). The sensor/actuator network of sensor nodes, actuator nodes, and a cluster head, constitutes a first wireless network having a first wireless communications protocol, operable to communicate via Radio 1.

1216. A second physical layer described by Herrmann includes a wireless network of cluster heads (and a panel) operable to communicate via Radio 2, stating "[f]or communication with other cluster heads, cluster heads may in addition include a second RF transceiver ("Radio 2") **with a larger bandwidth** and/or longer communication range, such as, for example, but not necessarily at another frequency band than the Radio 1." Therefore, Herrmann discloses "the first bandwidth less than the second bandwidth," as required by claim 2. Therefore, Herrmann discloses the limitations of claim 2 of the '495 Patent.

1217. As explained above in Section VIII.F.i, a POSITA seeking to implement Ahmed's wireless building control system for "both local and overall control operations" (Ahmed, [0007]), for

communication within and between separate space control subsystems would have known that the respective wireless communications networks would require two different bandwidth; however, said POSITA would have looked to the teachings of Herrmann to provide the information missing from Ahmed as to precisely which wireless network should be configured with the larger bandwidth. Incorporating the teachings of Herrmann with regard to the application of relative bandwidth size for the respective wireless networks would enable a POSITA to further optimize the two-tiered network architecture, comprising both a first and a second wireless network, based upon factors such as relative distance ranges over which said wireless networks are intended to communicate, the type of protocol used, and resource (e.g., power) conservation.

1218. Therefore, Ahmed in combination with Herrmann discloses "the first bandwidth less than the second bandwidth," as required by claim 2. Consequently, for at least the reasons presented here, it is my opinion that Claim 2 of the '495 Patent is either disclosed or rendered obvious by Ahmed in combination with Herrmann.

IX. INVALIDITY OF US PATENT NO. 8,264,371 ("the '371 Patent")

A. Summary of the '371 Patent

1219. United States Patent No. 8,264,371 ("the '371 patent"), titled "Method and device for communicating change-of-value information in a building automation system," was filed on January 3, 2008, was published on September 11, 2012, and claims a priority date of January 3, 2008.

1220. It is directed to automation components equipped for wireless communication in a building automation system and configured for processing change-of-value messages, and generating and communicating change-of-value updates via either push communications or a polling approach (see, e.g.,'371 patent at Abstract).

1221. The “BACKGROUND” section within the ’371 patent describes the field of the purported invention as relating “to methods and devices for communicating change-of-value information within a building automation system” (the ’371 patent at 1:10-11), wherein building automation systems typically involve a plurality of control elements and services integrated within and around a building or structure, and applicable to “the heating, ventilation and air conditioning (HVAC) systems, security services, fire systems and the like” (see, the ’371 patent at 1:13-15).

1222. The ’371 patent describes communication between wireless automation components in a building automation system that are configured to communicate information “upon detection of a change-of-value or a change in the state of a sense or monitored value, component and/or indicator” (the ’371 patent at 2:23-25). The “SUMMARY” section of the ’371 patent discloses a number of embodiments relating to an automation component in communication with at least one or more other automation component of the building automation system, wherein the first component may receive a change-of-value request message then both generate and communicate change-of-value updates in response to said messages (see, e.g., the ’371 patent at 2:26-38). Alternatively, the first component may detect an indication representing a change-of-value and then both generate and communicate a change-of-value message in response to the detected indication (see, e.g., the ’371 patent at 2:39-46). In other embodiments the first component may receive a change-of-value update, then both store and communicate said change-of-value update in response to a polling request (see, e.g., the ’371 patent at 2:47-59). The patent explains that change-of-values updates themselves may include change-of-value messages (see, e.g., the ’371 patent at 2:60-67).

1223. With respect to more detailed descriptions the ’371 patent, an embodiment is disclosed in the context of a “Request-Response (Polled) Communications” (see, the ’371 patent at 6:36-7:10,

see also Figs. 3 and 4) wherein an automation component, 200a, generates and communicates a change-of-value request message which "may request or direct the automation component 200b to indicate whether any of the local detected values, received values, parameters, or measurements have changed or altered beyond a pre-defined reporting limit, e.g. COV limit" (the '371 patent at 6:45-49). The automation component that receives the change-of-value request message may respond with a change-of-value acknowledgement message, indicating whether or not any detected, received, or measured values have changed beyond a pre-defined limit.

1224. The patent embodiments also include automation components that exchange information via "Push Communications" (see, the '371 patent at 7:11-8:25, see also Figs. 5). An automation component may assess whether detected, received, or measured values have changed by more than a pre-defined amount from the last reported value. When such values are determined to have exceed the pre-defined amount, the automation component "will create a Push COV message containing all queued COV values and send them to automation component" the next COV communication, which is scheduled to occur at regular intervals (see, the '371 patent at 7:18-30).

1225. During prosecution of the application that issued as the '371 patent (U.S. Patent Application No. 11/969,111), the examiner found the original claims as presented invalid in view of several prior art references, including U.S. Patent No. 6,167,316 ("Gloudeman"), U.S. Patent Publication No. 2006/0028997A1 ("McFarland"), U.S. Patent Publication No. 2007/0195808A1 ("Ehrlich"), U.S. Patent Publication No. 2005/0154494A1 ("Ahmed '494") and U.S. Patent No. 6,119,125 ("Gloudeman 2"). See Sept. 7, 2011 Non-Final Office Action. In response, the applicants amended certain claims to recite, among other things, the requirement of communicating the change-of-value update "at regular intervals according to a schedule or until a change-of-value acknowledgment is received." See Jan. 9, 2012 Response to Non-Final Office

Action. The applicants also argued that the cited prior art does not disclose this feature. See id. The examiner thereafter issued a Final Office Action finding the claims invalid as obviousness in view of the same art, including in further in view of U.S. Patent Publication No. 2002/0019215A1 ("Romans"), and further noted that Romans teaches communicating a change-of-value update at regular intervals according to a schedule or until a change of value acknowledgment is received. See Mar. 14, 2012 Final Office Action. In response, the applicants further amended certain claims to include, among other things, the requirement that the change-of-value update includes "a plurality of change-of-value messages received from a plurality of devices," and argued that the cited prior art does not disclose this feature. See May 10, 2012 Response to Final Office Action. On May 24, 2012, the examiner issued a Notice of Allowance, in which the examiner stated: "Specifically Gloudeman et al was the closest prior art, but fails to teaches generate a change-of-value update in response to the change-of-value request message, wherein the change-of-value update includes a plurality of change-of-value messages received from a plurality of devices; in contrary, the COV (change of value) mechanism in Gloudeman et al sends a singular change report message containing the updated value, and the claim specifically recites 'wherein the change-of-value update includes a plurality of change-of-value messages received from a plurality of devices'."

1226. As demonstrated below, the claim features added by applicant during prosecution were well known at the time, including in view of at least Kates, Helgeson, and Hitt. Kates, Helgeson, and Hitt were not before the examiner during prosecution of the application that issued as the '371 patent.

B. Claim Construction for the '371 Patent

1227. I have been asked to examine the '371 Patent-in-Suit, its associated prosecution histories and proceedings, prior art, and relevant materials to assess the validity of certain claims of the Patent-in-Suit. I describe herein my opinions regarding invalidity of the following claims, which I

understand to be the claims that are currently at issue in this lawsuit: '371 patent claims 1, 4, 5, 17 and 19.

1228. I have further reviewed the Claim Construction Order that I understand was issued by the Court in this lawsuit, and have applied the Court's constructions to my analysis below. Provided below is the Court's summary of its rulings on claim construction, but I understand further context has been provided in the Order, which I have also considered.

Disputed Term	**The Court's Construction**
"change-of-value request message" ('371 patent claims 1, 2, 6)	"a message that requests or directs an automation component to indicate if detected values, received values, parameters, or measurements have changed or altered beyond a predetermined reporting limit"
"change-of-value messages" ('371 patent claims 1, 8, 10, 13, 17, 19)	"messages indicating if detected values, received values, parameters, or measurements have changed or altered beyond a predetermined reporting limit"

1229. Regarding the above terms, the Court further clarified that "transmission of the detected values, received values, parameters, or measurements themselves can serve as that indication of change."

1230. Should any new or different claim constructions or interpretations arise in the future, I reserve the right to address those constructions, and any impact they may have on my opinions expressed herein.

1231. I have also reviewed the invalidity contentions and amendments thereto, and the subject matter eligibility contentions, asserted by ecobee in this lawsuit, including certain prior art identified therein. I have also reviewed Ollnova's responses to ecobee's interrogatory numbers 13 and 14 concerning invalidity and subject matter eligibility of the claims of the Patents-in-Suit.

1232. Throughout this report, I refer to selected portions of the cited documents to support my opinions. These citations are exemplary, and I reserve the right to rely on other portions of the documents to support my opinions as appropriate. In reaching the opinions in this report, I have considered, among other materials, the materials identified in the body of this report and in the attached Appendix B.

C. Claims 1, 4, 5, 17, and 19 are anticipated or obvious to a POSITA in view of Kates

i. Claim 1

1233. Claim 1 of the '371 Patent recites:

> An automation component configured for wireless communication within a building automation system, the automation component comprising:
>
> a wireless communications component;
>
> a processor in communication with the wireless communications component;
>
> a memory in communication with the processor, the memory configured to store computer readable instructions which are executable by the processor; wherein the computer readable instructions are programmed to:
>
> process a change-of-value request message received via the wireless communications component;
>
> generate a change-of-value update in response to the change-of-value request message, wherein the change-of-value update includes a plurality of change-of-value messages received from a plurality of devices; and
>
> communicate the change-of-value update via the wireless communication component at regular intervals according to a schedule or until a change-of-value acknowledgment is received.

1234. Claim 1 of the '371 Patent claims an automation component for a wireless building automation control system comprising of a unit with processor, wireless communications, and

memory that includes computer-readable instructions. This automation component is able to generate and process change-of-value requests and messages from a plurality of devices. This unit is also able to create and send messages to other components of the system at regular intervals or until receiving an acknowledgement.

1235. As detailed in an element-by-element analysis below, every limitation of Claim 1 is disclosed, or at least rendered anticipated or obvious to a POSITA in view of Kates.

a. **1[pre] An automation component configured for wireless communication within a building automation system, the automation component comprising:**

1236. To the extent that the preamble is limiting, Kates discloses or renders obvious to a POSITA an automation component configured for wireless communication within a building automation system, as discussed below.

1237. More specifically, Kates discloses a system comprising several types of wireless automation devices, for example, Kates describes "[a] low cost, robust, wireless sensor system that provides an extended period of operability without maintenance" (Kates, Abstract). Moreover, Kates discloses a system for autonomous monitoring of anomalous conditions which performs alarm functionality in the event that such a condition is detected (*see, e.g,.* Kates, Abstract). Kates additionally discloses "[i]n one embodiment, the sensor unit is bi-directional and configured to receive instructions from the central reporting station (or repeater). Thus, for example, the central reporting station can instruct the sensor to: perform additional measurements, go to a standby mode, wake up; report battery status, change wake-up interval, run self-diagnostics and report results, etc." (Kates, [0008]). The bi-directional, wireless repeater units of Kates which can receive and follow instructions constitute automation components configured for wireless communication within a building automation system.

1238. In more detail, Figure 1 of Kates (reproduced below) shows a sensor system that includes several remote sensor units 102-106 that are able to wirelessly communicate with the base unit 112 via one or more repeaters 110. As shown in Figure 1 of Kates, the monitoring computer system 113 is coupled on one side to a local computer network connection (not displayed) to which several example sensor systems are also coupled on the other via repeater units 110 and 111, and this network connection may take on one of several types, "such as, for example, Ethernet, wireless Ethernet, firewire port, Universal Serial Bus (USB) port, Bluetooth, etc." (Kates, [0029]). Thus, Kates discloses a wireless sensor system configured as a building automation system wherein repeater units 110, 111 constitute automation components configured for wireless communications.

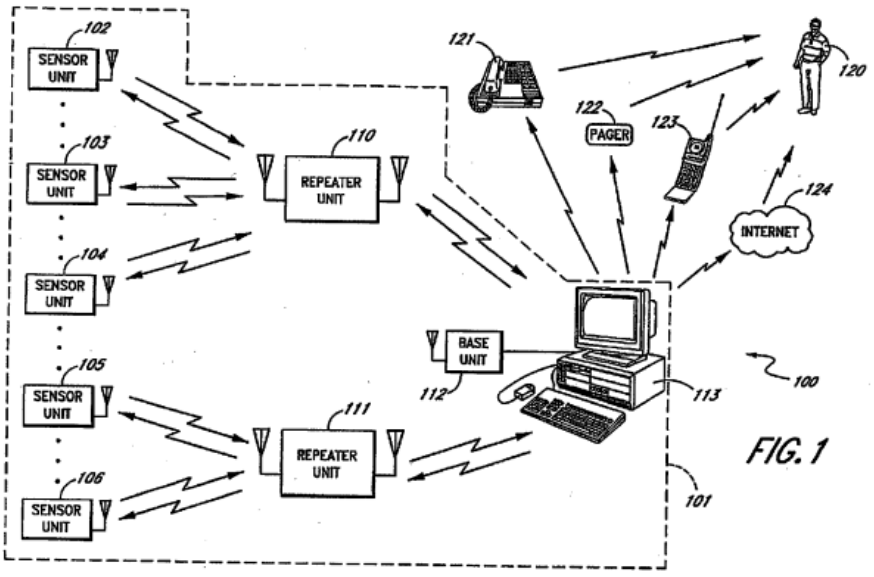


Figure 1 of Kates.

1239. Consequently, for at least the reasons above, to the extent that the preamble of claim 1 of the '371 patent is limiting, it is my opinion that Kates discloses the requirements of this preamble.

1240. In addition, as an alternate disclosure, figure 8 of Kates (reproduced below) shows an alternate embodiment of the sensor unit 102 (i.e., sensor unit 802 in Figure 8), which constitutes

the automation component of the building automated system in the preamble of claim 1. In more detail, Kates recites: "FIG. 8 shows the sensor system used to detect water leaks. In one embodiment, the sensor unit 102 [(i.e., 802)] includes a water level sensor and 803 and/or a water temperature sensor 804" (Kates, [0067]).

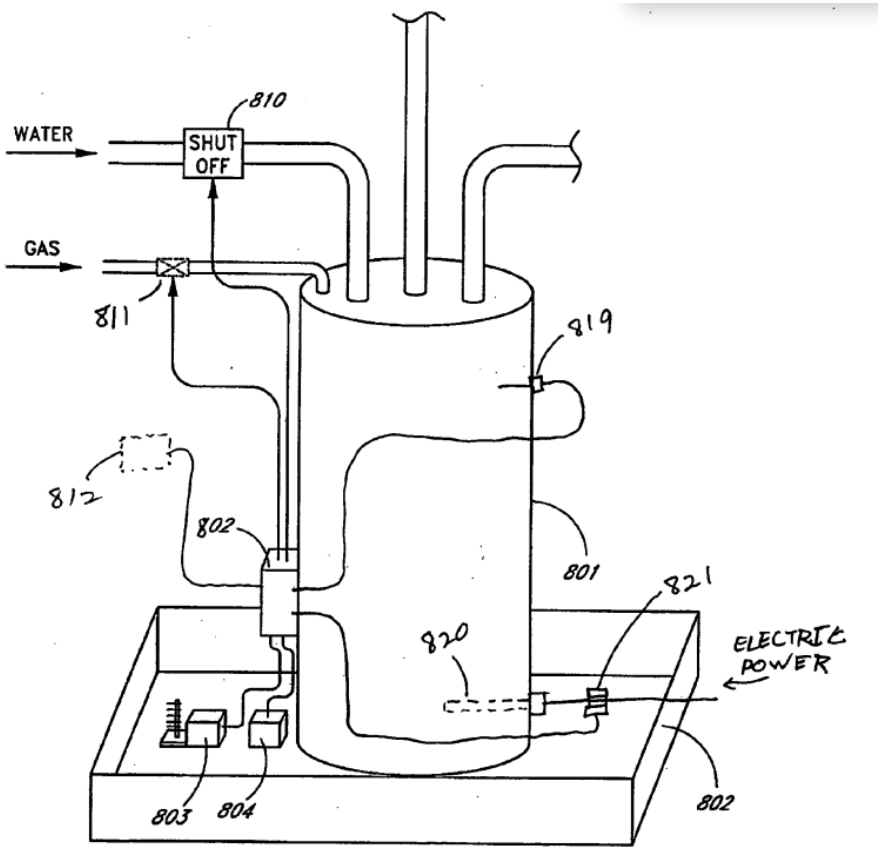


FIG. 8

Figure 8 of Kates

1241. This sensor unit 802, wherein sensors are located external to the sensor unit and routed via hard wiring to the sensor unit, may be utilized within the building automation system as described above, and thus to the extent that the preamble of claim 1 of the '371 patent is limiting, it is my opinion that Kates discloses the requirements of this preamble.

b. **1[a] a wireless communications component;**

1242. The limitations of claim element 1[a] of the '371 Patent are disclosed or rendered obvious to a POSITA by the Kates patent for at least the reasons described below.

1243. As discussed for claim element 1[pre], Kates discloses as automation component configured for wireless communications (i.e., repeater units 110, 111), for example Kates describes "[a] low cost, robust, wireless sensor system that provides an extended period of operability without maintenance" (Kates, Abstract). Kates additionally discloses "[i]n one embodiment, the sensor unit is bi-directional and configured to receive instructions from the central reporting station (or repeater). Thus, for example, the central reporting station can instruct the sensor to: perform additional measurements, go to a standby mode, wake up; report battery status, change wake-up interval, run self-diagnostics and report results, etc." (Kates, [0008]). More specifically, figure 1 of Kates "shows a sensor system 100 that includes a plurality of sensor units 102-106 that communicate with a base unit 112 through a number of repeater units 110-111" (Kates, [0029]) and an embodiment wherein "[t]he base unit 112 communicates with a monitoring computer system 113 through a computer network connection such as, for example, Ethernet, wireless Ethernet, firewire port, Universal Serial Bus (USB) port, Bluetooth, etc." (Kates, [0029]).

1244. Furthermore, figure 3 of Kates (reproduced below) shows that the repeater units therein include "a first transceiver 302" and "a second transceiver 304" with corresponding antennas (301 and 305 respectively). More specifically, Kates discloses "FIG. 3 is a block diagram of the repeater unit 110. In the repeater unit 110, a first transceiver 302 and a second transceiver 305 are provided to a controller 303" (Kates, [0054]). More specifically, in a description of figure 2 of Kates depicting a sensor unit 102, Kates states "[i]n the sensor unit 102, one or more sensors 201 and a transceiver 203 are provided to a controller 202" (Kates, [0050]), where "the transceiver 203 is

based on a TRF 6901 transceiver chip from Texas Instruments" (Kates, [0051]). The TRF 6901 from Texas Instruments is a single-chip radio frequency (RF) transceiver.[13] It would be obvious to a POSITA to design a repeater unit with the same transceiver hardware of the sensor units. Thus, it would be clear to a POSITA that the processor (i.e., controller 303) is in communication with at least one wireless communications component (i.e., transceivers 302 and 304).

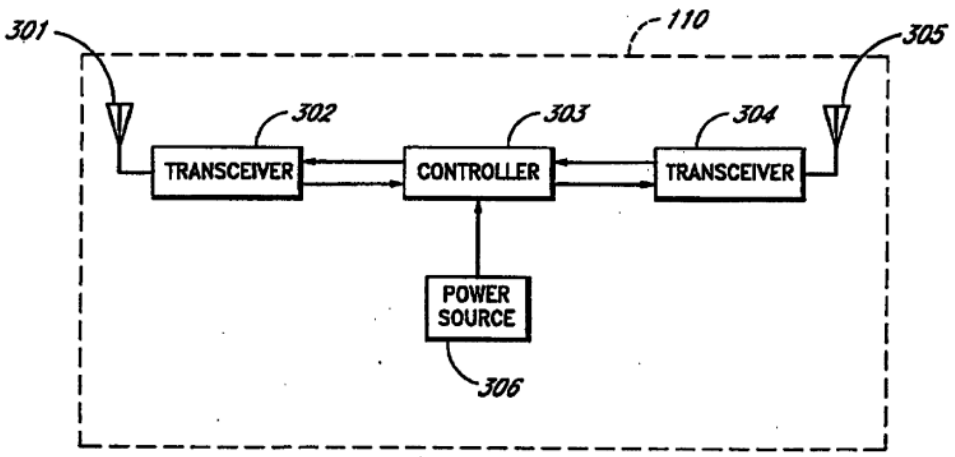


FIG. 3

Figure 3 of Kates

1245. Thus, for at least the reasons detailed above, Kates discloses that the automation component identified in the analysis for the preamble of claim 1 (i.e., repeater unit 110) also satisfies the additional limitation of comprising a wireless communications component of claim 1[a].

1246. In addition, as an alternate disclosure, figure 8 of Kates shows an alternate embodiment of the sensor unit 102 (i.e., sensor unit 802), which constitutes the automation component of the building automated system in the preamble of claim 1. In this alternate embodiment, in a

[13] *See* TRF6901 product page by Texas Instruments, accessed April 17, 2023. TRF6901 data sheet, product information and support | TI.com

description of Kates' figure 2 (reproduced below), Kates states "[i]n the sensor unit 102, one or more sensors 201 and a transceiver 203 are provided to a controller 202" (Kates, [0050]), where "the transceiver 203 is based on a TRF 6901 transceiver chip from Texas Instruments" (Kates, [0051]). The TRF 6901 from Texas Instruments is a single-chip radio frequency (RF) transceiver.[14] Thus, it would be clear to a POSITA that the processor (i.e., controller 202) is in communication with at least one wireless communications component (i.e., transceiver 203).

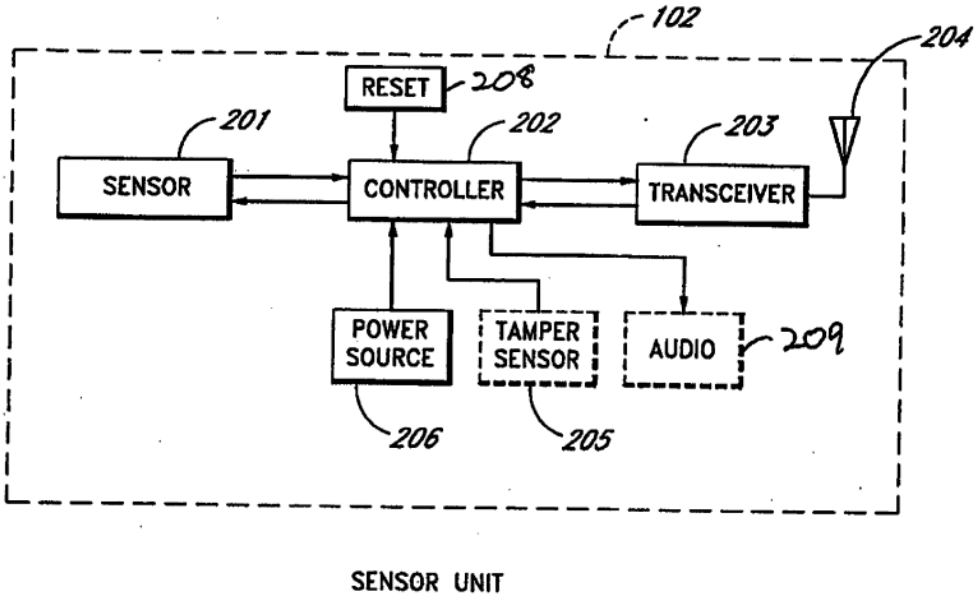


FIG. 2

Figure 2 of Kates

1247. Thus, for at least the reasons detailed above, Kates discloses that the automation component identified in the alternate embodiment analysis for the preamble of claim 1 (i.e., sensor unit 802) also satisfies the additional limitation of comprising a wireless communications component of claim 1[a].

[14] See TRF6901 product page by Texas Instruments, accessed April 17, 2023. TRF6901 data sheet, product information and support | TI.com

c. **1[b] a processor in communication with the wireless communications component;**

1248. The limitations of claim element 1[b] of the ’371 Patent are disclosed or rendered obvious to a POSITA by the Kates patent for at least the reasons described below.

1249. As discussed for claim element 1[a], Kates discloses a wireless automation device comprising at least one wireless communications component. Kates further discloses that this automation component further comprises a processor in communication with the wireless communications components. More specifically, Kates discloses a repeater unit having a controller 303.

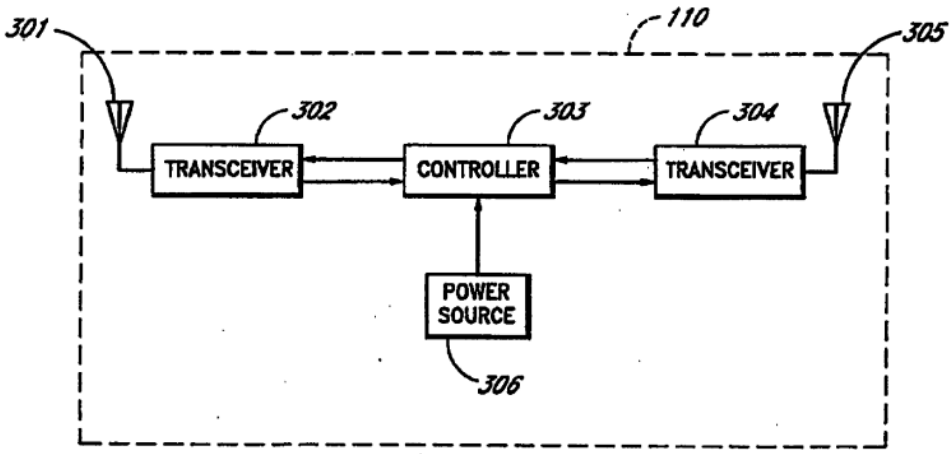


FIG. 3

Figure 3 of Kates

1250. Kates explains that controller 303 “typically provides power, data, and control information to the transceivers 302, 304.” (Kates, [0054]). Kates further explains that controller 303 “receives data from the first transceiver 303 and provides the data to the second transceiver 304,” and, “[w]hen relaying instructions from the base unit 112 to a sensor unit, the controller 303 receives

data from the second transceiver 304 and provides the data to the first transceiver 302" (Kates, [0055]). Kates further explains that "[t]he controller 303 also monitors the power source 306 and provides status information, such as, for example, self-diagnostic information and/or information about the health of the power source 306, to the base unit 112," where, "[i]n one embodiment, the controller 303 sends status information to the base unit 112 at regular intervals." (Kates, [0055]). Further, "[i]n one embodiment, the controller 303 sends status information to the base unit 112 when requested by the base unit 112." (Kates, [0055]; see also Kates, [0056]-[0057]).

1251. Furthermore, in a description of figure 2 of Kates (reproduced below), Kates states "[i]n the sensor unit 102, one or more sensors 201 and a transceiver 203 are provided to a controller 202" (Kates, [0050]), where "the transceiver 203 is based on a TRF 6901 transceiver chip from Texas Instruments" (Kates, [0051]). The TRF 6901 from Texas Instruments is a single-chip radio frequency (RF) transceiver.[15] It would be obvious to a POSITA to design a repeater unit with the same transceiver hardware of the sensor units. Thus, it would be clear to a POSITA that the processor (i.e., controller 303) is in communication with at least one wireless communications component (i.e., transceivers 302 and 304).

[15] *See* TRF6901 product page by Texas Instruments, accessed April 17, 2023. TRF6901 data sheet, product information and support | TI.com

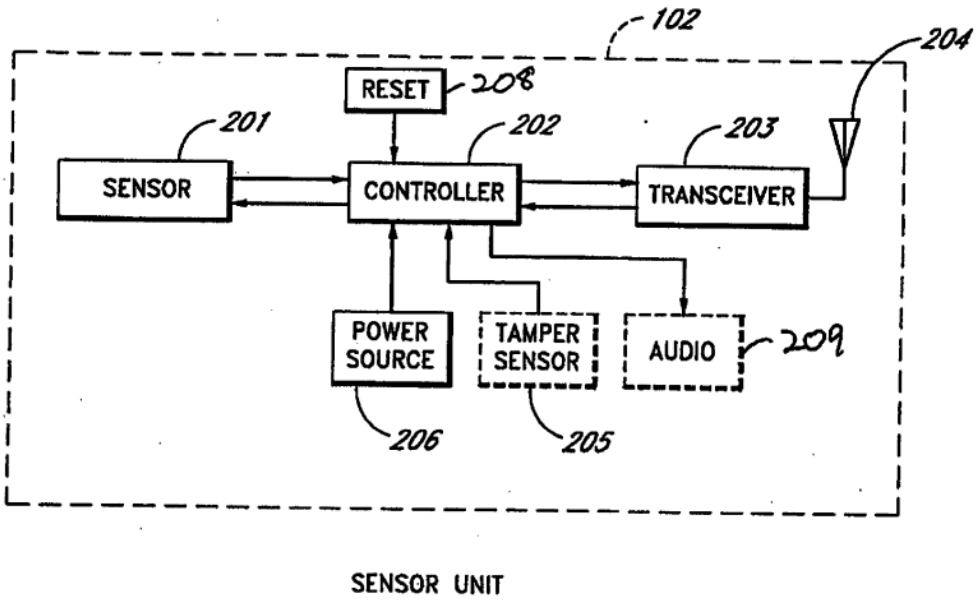


FIG. 2

Figure 2 of Kates

1252. Therefore, it would be clear to a POSITA that the controller 303 in a repeater unit of Kates would be in communication with a wireless communications component (i.e., transceiver 302, 304), and that Kates consequently discloses the requirements of claim element 1[b] of the '371 patent.

1253. In addition, as an alternate disclosure, figure 8 of Kates shows an alternate embodiment of the sensor unit 102 (i.e., sensor unit 802), which constitutes the automation component of the building automated system in the preamble of claim 1. In this alternate embodiment, in a description of figure 2 of Kates, Kates states "[i]n the sensor unit 102, one or more sensors 201 and a transceiver 203 are provided to a controller 202" (Kates, [0050]), where "the transceiver 203 is based on a TRF 6901 transceiver chip from Texas Instruments" (Kates, [0051]). The TRF 6901

from Texas Instruments is a single-chip radio frequency (RF) transceiver.[16] Thus, it would be clear to a POSITA that the processor (i.e., controller 202) is in communication with at least one wireless communications component (i.e., transceiver 203).

1254. Thus, for at least the reasons detailed above, Kates discloses that the automation component identified in the alternate embodiment analysis for the preamble of claim 1 (i.e., sensor unit 802) also satisfies the additional limitation of comprising a processor in communication with the wireless communications component of claim 1[b].

d. **1[c] a memory in communication with the processor, the memory configured to store computer readable instructions which are executable by the processor; wherein the computer readable instructions are programmed to:**

1255. The limitations of claim element 1[c] of the '371 Patent are disclosed by Kates for at least the reasons described below.

1256. As discussed for claim element 1[b], Kates discloses a wireless automation component (i.e., repeater unit 110) comprising a processor in communication with a wireless communications component (i.e., transceiver 302, 304). Kates explains that controller 303 "typically provides power, data, and control information to the transceivers 302, 304." (Kates, [0054]). Kates further explains that controller 303 "receives data from the first transceiver 303 and provides the data to the second transceiver 304," and, "[w]hen relaying instructions from the base unit 112 to a sensor unit, the controller 303 receives data from the second transceiver 304 and provides the data to the first transceiver 302." (Kates, [0055]). Kates further explains that "[t]he controller 303 also monitors the power source 306 and provides status information, such as, for example, self-diagnostic information and/or information about the health of the power source 306, to the base

[16] *See* TRF6901 product page by Texas Instruments, accessed April 17, 2023. TRF6901 data sheet, product information and support | TI.com

unit 112," where, "[i]n one embodiment, the controller 303 sends status information to the base unit 112 at regular intervals." (Kates, [0055]). Further, "[i]n one embodiment, the controller 303 sends status information to the base unit 112 when requested by the base unit 112." (Kates, [0055]; *see also* Kates, [0056]-[0057]). Kates further states "[t]he repeater units typically operate in an environment with several other repeater units and thus each repeater unit contains a database (e.g., a lookup table) of sensor IDs" (Kates, [0011]). A POSITA would understand that, in order to perform the functionality disclosed in Kates, the repeater unit would necessarily include memory (as part of Controller 303 or as a separate component not shown in the block diagram). Otherwise, Controller 303 would be unable to store the necessary programming to carry out the disclosed functionality, or store received sensor data for further transmission within the system.

1257. Further, Kates renders obvious to a POSITA that this wireless automation device further comprises a memory in communication with the processor, the memory configured to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor. For example, Kates states "[t]he repeater units typically operate in an environment with several other repeater units and thus each repeater unit contains a database (e.g., a lookup table) of sensor IDs" (Kates, [0011]). More specifically, in a description of figure 2 of Kates, Kates states "[i]n the sensor unit 102, one or more sensors 201 and a transceiver 203 are provided to a controller 202" (Kates, [0050]), where "[i]n one embodiment, the controller 202 is based on a Field Programmable Gate Array (FPGA), such as, for example, provided by Xilinx Corp." (Kates, [0051]). Indeed, FPGAs manufactured by Xilinx Corp. did include memory in communication with the processor. For example, the Virtex-5 FPGA[17], available by Xilinx Corp. in 2008, has

[17] *See* Virtex-5 product page by Xilinx Corporation, dated March 12, 2008, accessed April 19, 2023. Virtexk-5 Multi-Platform FPGA (archive.org)

Enhanced 36 kbit Block RAM and an option for commodity flash memory. Additionally, one of the three available configurations available at the time of the invention is "[o]ptimized for DSP and memory-intensive application with low-power serial connectivity." It would be obvious to a POSITA to design a repeater unit with the same processor hardware of the sensor units. Thus, it would be clear to a POSITA that the processor (i.e., controller 303), that maintains at least a database of sensor IDs (i.e., in memory), is in communication with at least one wireless communications component (i.e., transceivers 302 and 304). Therefore, it would be clear to a POSITA that memory would be in communication with the controller 303 in a repeater unit 110 of Kates.

1258. Kates also discloses that that "the repeater 110 is configured to receive instructions from the base unit 112. Thus, for example, the base unit 112 can instruct the repeater to: send commands to one or more sensors; go to standby mode; 'wake up'; report battery status; change wake-up interval; run self-diagnostics and reports results; etc." (Kates, [0045]). Furthermore, "the repeater unit 110 is configured to provide bi-directional communication between its sensors and the base unit 112" (Kates, [0034]). Thus, the repeater unit described above is in wireless communications with the base unit, which may send instructions to the repeater unit to act upon, such as those necessary to relay information between the base and unit and sensor units. Therefore, the repeater unit may be configured to receive and store computer readable instructions from the base unit.

1259. Therefore, for at least the reasons above, it would be clear to a POSITA that memory is in communication with the controller 303 of Kates, and that the controller and its associated memory may be programmed to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor, and that Kates consequently discloses the requirements of claim element 1[c] of the '371 patent.

1260. In addition, as an alternate disclosure, figure 8 of Kates shows an alternate embodiment of the sensor unit 102 (i.e., sensor unit 802), which constitutes the automation component of the building automated system in the preamble of claim 1. In this alternate embodiment, in a description of figure 2 of Kates, Kates states "[i]n the sensor unit 102, one or more sensors 201 and a transceiver 203 are provided to a controller 202" (Kates, [0050]), where "[i]n one embodiment, the controller 202 is based on a Field Programmable Gate Array (FPGA), such as, for example, provided by Xilinx Corp." (Kates, [0051]). Indeed, FPGAs manufactured by Xilinx did include memory in communication with the processor. For example, the Virtex-5 FPGA[18], available by Xilinx in 2008, has Enhanced 36 kbit Block RAM and an option for commodity flash memory. Additionally, one of the three available configurations available at the time of the invention is "[o]ptimized for DSP and memory-intensive application with low-power serial connectivity." Thus, it would be clear to a POSITA that the processor (i.e., controller 202) is in communication with at least one wireless communications component (i.e., transceiver 203).

1261. Thus, for at least the reasons detailed above, Kates discloses that the automation component identified in the alternate embodiment analysis for the preamble of claim 1 (i.e., sensor unit 802) also satisfies the additional limitation of comprising a memory in communication with the controller 202 of claim 1[c].

e. **1[d] process a change-of-value request message received via the wireless communications component;**

1262. The limitations of claim element 1[d] of the '371 Patent are disclosed by the Kates patent for at least the reasons described below.

[18] See Virtex-5 product page by Xilinx Corporation, dated March 12, 2008, accessed April 19, 2023. Virtexk-5 Multi-Platform FPGA (archive.org)

1263. As discussed for claim element 1[c], Kates discloses that the repeater automation component comprises a memory in communication with a processor. Additionally, Kates discloses that the memory can store computer readable instructions that may be programmed to process a change-of-value request message received via the wireless communications component. More specifically, Kates states that "the sensor unit 102 provides bi-directional communication and is configured to receive data and/or instructions from the base unit 112. Thus, for example, the base unit 112 can instruct the sensor unit 102 to perform additional measurements, to go to a standby mode, to wake up, to report battery status, to change wake-up interval, to run self-diagnostics and report results, etc." (Kates, [0034]). In another embodiment, "the central reporting station can instruct the repeater to: send commands to one or more sensors, go to standby mode, "wake up", report battery status, change wake-up interval; run self-diagnostics and report results, etc." (Kates, [0012]). By combining this functionality with the power saving functionality of Kates with a repeater between a base unit and sensor unit, a POSITA would recognize that the repeater would be able to receive and process instructions from the base unit to send commands to sensor units, which would then be able to provide the repeater with change-of-value updates.

1264. In more detail, Kates discloses that "[i]n order to conserve battery power, the sensor is normally placed in a low-power mode," and "while in the low power mode, the sensor unit takes regular sensor readings and evaluates the readings to determine if an anomalous condition exists" (Kates, [0033]). In the invention of Kates, upon evaluation of the readings, "[i]f an anomalous condition is detected, then the sensor unit 'wakes up' and begins communicating with the base unit or with a repeater" (Kates, [0033]). Broadly, the power saving functionality demonstrates that the teachings of Kates allows for automation components comprising sensors to conserve battery life by only checking the values of sensors at regularly defined intervals, which occur at "programmed

intervals," at which "the sensor unit 102 also 'wakes up' and sends status information (e.g., power levels, self[-]diagnostic information, etc.) to the base unit (or repeater) and then listens for commands for a period of time" (Kates, [0033]).

1265. In order for the anomalous detection to be communicated from the sensor unit 102, such an anomaly must be detected, which would require the identification of sensor values when it takes readings, and an evaluation of those readings against a set of criteria that would determine if the reading was, in fact, anomalous. Kates explicitly discloses this functionality, namely that "[t]he controller 202 receives sensor data from the sensor(s) 201," and "the controller 202 evaluates the sensor data by comparing the data value to a threshold value (e.g., a high threshold, a low threshold, or a high-low threshold). If the data is outside the threshold (e.g., above a high threshold, below a low threshold, outside an inner range threshold, or inside an outer range threshold), then the data is deemed to be anomalous and is transmitted to the base unit 112" (Kates, [0052]), or via a repeater unit 111. A POSITA would understand that the high-low threshold "outside an inner range threshold" would correspond with change-of-value threshold to provide a change-of-value update within the building automation system of Kates.

1266. More specifically, it would be known to a POSITA that there is a finite number of threshold choices available for such an application: (1) a high threshold (i.e., above a high threshold); (2) a low threshold (i.e., below a low threshold); (3) within a range of values (i.e., outside an inner range threshold); (4) not within a range of values (i.e., inside an outer range threshold); and (5) a combination of the previous options. Moreover, a POSITA would understand that the threshold choice above could be applied to *absolute* values (i.e., fixed, predetermined thresholds) or to *relative* values (i.e., thresholds that depend on the previous or current measured values). Indeed, it is obvious to a POSITA that one criterion that grants the benefits of Kates—i.e., reduced

transmission energy usage by selective determination of when to transmit data—could be implemented using a relative application of choice (4) such that data is only transmitted when a meaningful change occurs. This would, for example, increase the battery life of a temperature sensor by preventing repeated transition of the same temperature when a room's temperature is stable; because an HVAC system only needs to act when temperature changes, there is no need for a constant temperature to be repeatedly transmitted and thus the system of Kates achieves its goal of reducing transmission of data without effecting how the HVAC system operates.

1267. In more detail, to effectively determine when a sensor reading has changed from that of a previous reading, it would be obvious to a POSITA that a small inner range threshold would be used. For example, if a temperature has a set point of a certain value, an inner range threshold criteria (e.g., as would be commonly associated with a deadband range) could be plus or minus one degree. Thus, if a temperature reading within a room within a building is taken that falls outside of this narrow range, then the system would detect a change-of-value from the set point, and the condition would be reported to the base unit or via a repeater to maintain the system to operate as intended. As such, a POSITA would be motivated to implement the inner range threshold from Kates as a change-of-value threshold to determine if a change-of-value has occurred. In other words, using the inner range threshold criteria to send an alert if a measurement is outside a predefined range, which would be obvious to a POSITA interested in maintaining a system at particular sensor reading values while checking readings periodically, in view of Kates's emphasis on energy efficiency. As such, the sensor units of Kates would be able to provide sensor value information or a change-of-value update based upon a requested sensor reading to a repeater unit if requested.

1268. More specifically, Kates discloses "[i]n one embodiment, the repeater is configured to provide bi-directional communication between one or more sensors and a base unit. In one embodiment, the repeater is configured to receive instructions from the central reporting station (or repeater). Thus, for example, the central reporting station can instruct the repeater to: send commands to one or more sensors, go to standby mode, "wake up", report battery status, change wake-up interval; run self-diagnostics and report results, etc." (Kates, [0012]). It would therefore be clear to a POSITA that the repeater units of Kates would be able to receive instructions from a base unit (e.g., a change-of-value update request) and relay the request to a sensor unit to provide a new sensor value reading or change-of-value update, and therefore process the change-of-value update request, via the wireless communications component in communication with the processor as detailed for claim elements 1[a] and 1[b].

1269. Consequently, for at least the reasons above, Kates discloses memory in communication with the processor, configured to process a change-of-value request message received via the wireless communications component, as required by the 1[d] claim by '371 patent.

1270. In addition, as an alternate disclosure, figure 8 of Kates shows an alternate embodiment of the sensor unit 102 (i.e., sensor unit 802), which constitutes the automation component of the building automated system in the preamble of claim 1. In this alternate embodiment, in order for the anomalous detection to be communicated from the sensor unit 102, such an anomaly must be detected, which would require the identification of sensor values when it takes readings, and an evaluation of those readings against a set of criteria that would determine if the reading was, in fact, anomalous. Kates explicitly discloses this functionality within the sensor unit 802, namely that "[t]he controller 202 receives sensor data from the sensor(s) 201," and "the controller 202 evaluates the sensor data by comparing the data value to a threshold value (e.g., a high threshold,

a low threshold, or a high-low threshold). If the data is outside the threshold (e.g., above a high threshold, below a low threshold, outside an inner range threshold, or inside an outer range threshold), then the data is deemed to be anomalous and is transmitted to the base unit 112" (Kates, [0052]). A POSITA would understand that the high-low threshold "outside an inner range threshold" would correspond with change-of-value threshold to provide a change-of-value update within the building automation system of Kates.

1271. More specifically, it would be known to a POSITA that there is a finite number of threshold choices available for such an application: (1) a high threshold (i.e., above a high threshold); (2) a low threshold (i.e., below a low threshold); (3) within a range of values (i.e., outside an inner range threshold); (4) not within a range of values (i.e., inside an outer range threshold); and (5) a combination of the previous options. Moreover, a POSITA would understand that the threshold choice above could be applied to absolute values—i.e., fixed, predetermined thresholds—or to relative values—i.e., thresholds that depend on the previous or current measured values. Indeed, it is obvious to a POSITA that one criterion that grants the benefits of Kates—i.e., reduced transmission energy usage by selective determination of when to transmit data—could be implemented using a relative application of choice (4) such that data is only transmitted when a meaningful change occurs. This would, for example, increase the battery life of a temperature sensor by preventing repeated transition of the same temperature when a room's temperature is stable; because an HVAC system only needs to act when temperature changes, there is no need for a constant temperature to be repeatedly transmitted and thus the system of Kates achieves its goal of reducing transmission of data without effecting how the HVAC system operates.

1272. In more detail, to effectively determine when a sensor reading has changed from that of a previous reading, it would be obvious to a POSITA that a small inner range threshold would be

used. For example, if a temperature has a set point of a certain value, an inner range threshold criteria could be plus or minus one degree. Thus, if a temperature reading within a room within a building is taken that falls outside of this narrow range, then the system would detect a change-of-value from the set point, and the condition would be reported to the base unit or via a repeater to maintain the system to operate as intended. As such, a POSITA would be motivated to implement the inner range threshold from Kates as a change-of-value threshold to determine if a change-of-value has occurred. In other words, using the inner range threshold criteria to send an alert if a measurement is outside a predefined range, which would be obvious to a POSITA interested in maintaining a system at particular sensor reading values while checking readings periodically, in view of Kates's emphasis on energy efficiency. As such, the sensor units of Kates would be able to provide sensor value information or a change-of-value update based upon a requested sensor reading to a base unit if requested. It would therefore be clear to a POSITA that the sensor unit 802 of Kates would be able to receive instructions from a base unit (e.g., a change-of-value update request) and therefore process the change-of-value update request, via the wireless communications component in communication with the processor as detailed for the alternate embodiment analysis of claim elements 1[a] and 1[b].

1273. Thus, for at least the reasons detailed above, Kates discloses that the automation component identified in the alternate embodiment analysis for the preamble of claim 1 (i.e., sensor unit 802) also satisfies the additional limitation of processing a change-of-value request message received via the wireless communications component of claim 1[d].

f. **1[e] generate a change-of-value update in response to the change-of-value request message, wherein the change-of-value update includes a plurality of change-of-value messages received from a plurality of devices; and**

1274. The limitations of claim element 1[e] of the '371 patent are disclosed by the Kates patent for at least the reasons described below.

1275. As discussed for claim element 1[d], a repeater automation component of Kates can receive and process a change-of-value request message from a base unit. Further, upon receipt of the change-of-value request message, the repeater can "send commands to one or more sensors, go to standby mode, "wake up", report battery status, change wake-up interval; run self-diagnostics and report results, etc." (Kates, [0012]). Among the commands that sensor unit may receive (from the repeater in response to a receiving a change-of-value request message from the base unit) include "to perform additional measurements, to go to a standby mode, to wake up, to report battery status, to change wake-up interval, to run self-diagnostics and report results, etc." (Kates, [0034]). It would be recognized by a POSITA that when the sensor unit receives a message with instructions to perform additional measurements, it would perform sensor readings and communicate the readings to the sensor unit controller, at which point "the controller 202 evaluates the sensor data by comparing the data value to a threshold value (e.g., a high threshold, a low threshold, or a high-low threshold). If the data is outside the threshold (e.g., above a high threshold, below a low threshold, outside an inner range threshold, or inside an outer range threshold), then the data is deemed to be anomalous and is transmitted to the base unit 112" (Kates, [0052]). As further described for claim element 1[d], a sensor unit would be able to process a change-of value according to the high-low threshold "outside an inner range threshold" threshold to provide a change-of-value update to the repeater unit within the building automation system of Kates.

1276. Kates further discloses that the repeater can communicate with one or more (i.e., a plurality of) sensor units. In more detail, Kate discloses "[t]he repeater unit is configured to relay communications traffic between a number of sensor units and the base unit" (Kates, [0011]). In more detail, Kates discloses that "[t]he base unit is configured to receive measured sensor data from a number of sensor units" and that "the sensor information is relayed through the repeater units" (Kates, [0013]). As previously described above, the circuitry within the sensor unit would be able to process a change-of-value from a previous reading value by the change-of-value threshold (i.e., sensor information) discussed in claim element 1[d], which it could then provide to the repeater unit. As this change-of-value update functionality can be performed for at least each sensor unit within a repeater unit's database, it would readily apparent to a POSITA that the repeater unit can receive a plurality of change-of-value messages received from a plurality of devices.

1277. Upon receiving a plurality of change-of-value messages from a plurality of sensor devices, it would be straightforward for a POSITA to further program the repeater unit to receive and process the plurality of change-of-value messages into an update before communicating a change-of-value update back to the base unit. Indeed, Kates explains that controller 303 of the repeater unit "receives data from the first transceiver 303 and provides the data to the second transceiver 304," and, "[w]hen relaying instructions from the base unit 112 to a sensor unit, the controller 303 receives data from the second transceiver 304 and provides the data to the first transceiver 302" (Kates, [0055]). Thus, Kates expressly discloses receiving information from, e.g., one or more sensor units via one transceiver, and the controller controlling the retransmission of that that information to the base unit via another transceiver. It would be straightforward for a POSITA to program the repeater to, e.g., collect, combine or aggregate the information received

from the sensor units before transmission to the base unit. This functionality would be motivated by Kates's focus on energy efficiency of the building automation system; that is, a POSITA would be motivated to program the repeater and sensor units to communicate at regular intervals to save battery life of the repeater, sensor, and base units. In other words, it would be straightforward to instruct the repeater to request change-of-value updates from a plurality of sensor units but wait until all change-of-value messages are received prior to communicating back to the base unit, allowing the sensor and repeaters units to maintain their low power functionalities and minimizing the number of data transmissions between the repeater and base unit.

1278. Furthermore, it would be recognized by a POSITA that a repeater unit that can receive and store change-of-value updates from a plurality of devices can be further programmed to compile the updates into a single transmission, thus generating a change-of-value update in response to the change-of-value request message, wherein the change-of-value update includes a plurality of change-of-value messages received from a plurality of devices. Consequently, for at least the reasons above, it would be obvious to a POSITA that Kates discloses the limitations of claim element 1[e] of the '371 patent.

1279. In addition, as an alternate disclosure, figure 8 of Kates shows an alternate embodiment of the sensor unit 102 (i.e., sensor unit 802), which constitutes the automation component of the building automated system in the preamble of claim 1. In this alternate embodiment, as discussed for the alternate embodiment analysis for claim element 1[d], a sensor unit 802 automation component of Kates can receive and process a change-of-value request message from a base unit. Further, upon receipt of the change-of-value request message, the sensor unit 802 "can instruct the sensor unit 102 to perform additional measurements, to go to a standby mode, to wake up, to report battery status, to change wake-up interval, to run self-diagnostics and report results, etc. In one

embodiment, the sensor unit 102 reports its general health and status on a regular basis (e.g., results of Self-diagnostics, battery health, etc.)" (Kates, [0034]). It would be recognized by a POSITA that when the sensor unit receives a message with instructions to perform additional measurements, it would perform sensor readings and communicate the readings to the sensor unit controller, at which point "the controller 202 evaluates the sensor data by comparing the data value to a threshold value (e.g., a high threshold, a low threshold, or a high-low threshold). If the data is outside the threshold (e.g., above a high threshold, below a low threshold, outside an inner range threshold, or inside an outer range threshold), then the data is deemed to be anomalous and is transmitted to the base unit 112" (Kates, [0052]). As further described for claim element 1[d], a sensor unit would be able to process a change-of value according to the high-low threshold "outside an inner range threshold" threshold to provide a change-of-value update to the repeater unit within the building automation system of Kates.

1280. Kates further discloses that the sensor unit 802 can communicate with one or more sensors, e.g., 803, 804, 819, and 821. Such sensors include, for example, water level sensors, electric current sensors, and other sensors that generate information indicating whether a change of value has occurred that requires further action (*see* Kates, [0067]-[0075]). As previously described above, the circuitry within the sensor unit 802 would be able to process a change-of-value from a previous reading value by the change-of-value threshold (i.e., sensor information) discussed in the alternate embodiment analysis for claim element 1[d], which it could then provide to the base unit. As this change-of-value update functionality can be performed for at least each external sensor devices connected to the sensor unit 802, it would be readily apparent to a POSITA that the sensor unit 802 can generate a plurality of change-of-value messages received from a plurality of devices.

1281. Thus, for at least the reasons detailed above, Kates discloses that the automation component identified in the alternate embodiment analysis for the preamble of claim 1 (i.e., sensor unit 802) also satisfies the additional limitation of generating a change-of-value update in response to the change-of-value request message, wherein the change-of-value update includes a plurality of change-of-value messages received from a plurality of devices of claim 1[e].

g. **1[f] communicate the change-of-value update via the wireless communication component at regular intervals according to a schedule or until a change-of-value acknowledgment is received.**

1282. The limitations of claim element 1[f] of the '371 patent are disclosed by Kates for at least the reasons described below.

1283. As discussed for claim element 1[e], the repeater of Kates may be programmed by a POSITA to receive a plurality of change-of-value update messages from the sensor units save into its database of sensor IDs in response to the change-of-value message request from the base unit as described for claim element 1[d] and compile the plurality of sensor messages into a single change-of-value message for communication back to the base unit. Kates additionally discloses methods in which this compiled change-of-value update can be communicated back to the base unit, namely at regular intervals according to a schedule. In more detail, Kates explicitly discloses "[i]n one embodiment, the controller 303 sends status information to the base unit 112 at regular intervals" (Kates, [0055]). It would be clear to a POSITA that such status information could comprise repeater health or sensor information as requested by the repeater unit, including sensor value data or change-of-value updates from each sensor in wireless communication with the repeater.

1284. Alternatively, another method for the communication of the change-of-value update message from the repeater to the base unit disclosed by Kates is to wait until a change-of-value

acknowledgment is received. More specifically, Kates discloses that "[i]n one embodiment, the sensor continues to transmit data until it receives an acknowledgement from the base unit that the message has been received" (Kates, [0038]). It would be obvious to a POSITA to apply this functionality to the repeater unit in addition to the sensor units. Alternatively, as a relay unit, the repeater unit could forward an acknowledgement from the base unit to the sensor units, as described in Kates, which recites: "[i]n one embodiment, the sensor unit transmits sensor data until a handshaking-type acknowledgement is received. Thus, rather than sleep [i]f no instructions or acknowledgements are received after transmission (e.g., after the decision block 613 or 709) the sensor unit 102 retransmits its data and waits for an acknowledgement. The sensor unit 102 continues to transmit data and wait for an acknowledgement until an acknowledgement is received. In one embodiment, the sensor unit accepts an acknowledgement from a repeater unit 111 and it then becomes the responsibility of the repeater unit 111 to make sure that the data is forwarded to the base unit 112" (Kates, [0065]). Therefore, a POSITA would recognize that repeater would be able to communicate the change-of-value update until a change-of-value acknowledgment is received.

1285. Thus, for at least the reasons disclosed above, Kates discloses memory in communication with the processor, configured to communicate the change-of-value update via the wireless communication component at regular intervals according to a schedule or until a change-of-value acknowledgment is received, as required by the 1[f] claim by '371 patent.

1286. In addition, as an additional disclosure, figure 8 of Kates shows an alternate embodiment of the sensor unit 102 (i.e., sensor unit 802), which constitutes the automation component of the building automated system in the preamble of claim 1. In this alternate embodiment, as discussed for the alternate embodiment analysis for claim element 1[e], the sensor unit 802 of Kates may be

programmed by a POSITA to generate a change-of-value message comprises a plurality of change-of-value update messages from the sensor devices in response to the change-of-value message request from the base unit as described for claim element 1[d] and compile the plurality of sensor messages into a single change-of-value message for communication back to the base unit. Kates additionally discloses methods in which this compiled change-of-value update can be communicated back to the base unit, namely at regular intervals according to a schedule. In more detail, Kates explicitly discloses that "at programmed intervals, the sensor unit 102 also "wakes up" and sends status information (e.g., power levels, self[-]diagnostic information, etc.) to the base unit (or repeater) and then listens for commands for a period of time" (Kates, [0033]). It would be clear to a POSITA that such status information could comprise sensor health or sensor device information as requested by the base unit, including sensor value data or change-of-value updates from each sensor device connected to the sensor unit 802. Alternatively, another method for the communication of the change-of-value update message from the sensor unit 802 to the base unit 112 disclosed by Kates is to wait until a change-of-value acknowledgment is received. More specifically, Kates discloses that "[i]n one embodiment, the sensor continues to transmit data until it receives an acknowledgement from the base unit that the message has been received" (Kates, [0038]). Therefore, a POSITA would recognize that sensor unit 802 would be able to communicate the change-of-value update until a change-of-value acknowledgment is received from the base unit.

1287. Thus, for at least the reasons detailed above, Kates discloses that the automation component identified in the alternate embodiment analysis for the preamble of claim 1 (i.e., sensor unit 802) also satisfies the additional limitation of communicating the change-of-value update via the

wireless communication component at regular intervals according to a schedule or until a change-of-value acknowledgment is received of claim 1[f].

ii.Claim 4

1288. Claim 4 of the ’371 Patent recites:

> The automation component of claim 1, wherein the change-of-value update is a change-of-value response message.

1289. Claim 4 of the ’371 depends upon claim 1 therein and includes additional limitations pertaining to the information contained within the change-of-value update. For at least the reasons detailed above in relation to claim 1, it is my opinion that Kates discloses each and every limitation of claim 1 of the ’371 patent; and, for at least the reasons below, it is my opinion that Kates also renders obvious the limitation added by claim 4.

1290. As discussed for claim 1, Kates discloses a wireless repeater automation component (i.e., repeater 110) within a building automation system. More specifically, as detailed for claim elements 1[a] through 1[d], the repeater unit of Kates contains a memory in communication with a processor (i.e., controller 303) that is also in communication with at least one wireless communications component (i.e., transceivers 302 and 304) that provide a means by which to wirelessly communicate information between the base unit and the sensor units. Further, as detailed for claim elements 1[d] through 1[f], the repeater may be configured to: (1) receive a request message from the base unit for a change-of-value request; (2) forward the change-of-value request message to one or more sensor units; (3) receive sensor information corresponding to changes-of-value from each of the sensor units; (4) generate a change-of-value update by compiling the change-of-value updates from each of the sensor units in communication with the repeater unit; and (5) communicate the change-of-value update back to the base unit. More specifically, as discussed for claim element 1[e], a POSITA would be motivated to program the

repeater and sensor units to communicate at regular intervals to save battery life of the repeater and sensor units. In other words, it would be straightforward to instruct the repeater to request change-of-value updates from a plurality of sensor units, but wait until all change-of-value messages are received prior to communicating back to the base unit, allowing the sensor and repeaters units to maintain their low power functionalities and minimizing the number of data transmissions between the repeater and base unit.

1291. As such, it would be recognized to a POSITA that there are different kinds of information the change-of-value update could contain, including but not limited to (1) sensor measurement values; (2) sensor status information; (3) repeated status information; (4) a message comprising sensor change-of-value information; and (5) combinations of the above. That is, one type of information within the change-of-value update may include at least one message containing change-of-updates messages from more than one sensor unit, in addition to other kinds of information obtained from the sensor unit. Therefore, it would be known to a POSITA that the change-of-value update may include a change-of-value response message. Thus, for at least the reasons disclosed above, Kates discloses an automation component of claim 1, wherein the change-of-value update is a change-of-value response message, as required by claim 4 by ’371 patent.

1292. In addition, as an alternate disclosure, figure 8 of Kates shows an alternate embodiment of the sensor unit 102 (i.e., sensor unit 802), which constitutes the automation component of the building automated system of claim 1. In this alternate embodiment, as discussed for the alternate embodiment analysis for claim 1, Kates discloses a wireless automation component (i.e., sensor 802) within a building automation system. More specifically, as detailed for claim elements 1[a] through 1[d], the sensor unit 802 of Kates contains a memory in communication with a processor (i.e., controller 202) that is also in communication with at least one wireless communications

component (i.e., transceiver 203) that provides a means by which to wirelessly communicate information to and from the base unit. Further, as detailed for claim elements 1[d] through 1[f], the sensor unit 802 may be configured to: 1) receive a request message from the base unit for a change-of-value request; 2) forward the change-of-value request message to one or more sensor units; 3) receive sensor information corresponding to changes-of-value from each of the sensor units; 4) generate a change-of-value update by compiling the change-of-value updates from each of the sensor units in communication with the repeater unit; and 5) communicate the change-of-value update back to the base unit. More specifically, as discussed for claim element 1[e], a POSITA would be motivated to program the sensor unit 802 to communicate at regular intervals to save battery life. In other words, it would be straightforward to instruct the sensor unit 802 to request change-of-value updates from a plurality of sensor devices, but wait until all change-of-value messages are received prior to communicating back to the base unit, allowing the sensor and repeaters units to maintain their low power functionalities and minimizing the number of data transmissions to the base unit.

1293. As such, it would be recognized to a POSITA that there are different kinds of information the change-of-value update could contain, including but not limited to (1) sensor measurement values; (2) sensor status information; (3) repeated status information; (4) a message comprising sensor change-of-value information; and (5) combinations of the above. That is, one type of information within the change-of-value update may include at least one message containing change-of-updates messages from more than one sensor device external to the sensor unit 802, in addition to other kinds of information obtained from the sensor unit (e.g., self[-]diagnostics). Thus, for at least the reasons detailed above, Kates discloses that the automation component identified in the alternate embodiment analysis for the preamble of claim 1 (i.e., sensor unit 802) also satisfies

the additional limitation of wherein the change-of-value update is a change-of-value response message of claim 4.

iii.Claim 5

1294. Claim 5 of the ’371 Patent recites:

> The automation component of claim 1, wherein the change-of-value update is automatically communicated.

1295. Claim 5 of the ’371 depends upon claim 1 therein, and includes additional limitations pertaining to the method in which the change-of-value update is communicated. For at least the reasons detailed above in relation to claim 1, it is my opinion that Kates discloses each and every limitation of claim 1 of the ’371 patent; and, for at least the reasons below, it is my opinion that Kates also renders obvious the limitation added by claim 5.

1296. As discussed for claim 1, Kates discloses a wireless repeater automation component (i.e., repeater 110) within a building automation system. More specifically, as detailed for claim elements 1[a] through 1[d], the repeater unit of Kates contains a memory in communication with a processor (i.e., controller 303) that is also in communication with at least one wireless communications component (i.e., transceivers 302 and 304) that provide a means by which to wirelessly communicate information between the base unit and the sensor units. Further, as detailed for claim elements 1[d] through 1[f], the repeater may be configured to: 1) receive a request message from the base unit for a change-of-value request; 2) forward the change-of-value request message to one or more sensor units; 3) receive sensor information corresponding to changes-of-value from each of the sensor units; 4) generate a change-of-value update by compiling the change-of-value updates from each of the sensor units in communication with the repeater unit; and 5) communicate the change-of-value update back to the base unit. More specifically, as discussed for claim element 1[f], a POSITA would be motivated to program the repeater and sensor

units to communicate at regular intervals to save battery life of the repeater and sensor units. In other words, it would be clear to a POSITA that the repeater unit would automatically and wirelessly communicate the change-of-value update to the base unit at regular intervals according to instructions programmed into the controller 303.

1297. Consequently, for at least the reasons above, Kates discloses the repeater automation component of claim 1, wherein the change-of-value update is automatically communicated, as required by claim 5 by the ’371 patent.

1298. In addition, as an alternate disclosure, figure 8 of Kates shows an alternate embodiment of the sensor unit 102 (i.e., sensor unit 802), which constitutes the automation component of the building automated system of claim 1. In this alternate embodiment, as discussed for the alternate embodiment analysis for claim 1, Kates discloses a wireless automation component (i.e., sensor 802) within a building automation system. More specifically, as detailed for claim elements 1[a] through 1[d], the sensor unit 802 of Kates contains a memory in communication with a processor (i.e., controller 202) that is also in communication with at least one wireless communications component (i.e., transceiver 203) that provides a means by which to wirelessly communicate information to and from the base unit. Further, as detailed for claim elements 1[d] through 1[f], the sensor unit 802 may be configured to: 1) receive a request message from the base unit for a change-of-value request; 2) forward the change-of-value request message to one or more sensor units; 3) receive sensor information corresponding to changes-of-value from each of the sensor units; 4) generate a change-of-value update by compiling the change-of-value updates from each of the sensor units in communication with the repeater unit; and 5) communicate the change-of-value update back to the base unit. More specifically, as discussed for claim element 1[f], a POSITA would be motivated to program the sensor units to communicate at regular intervals to

save battery life. In other words, it would be clear to a POSITA that the sensor unit 802 would automatically and wirelessly communicate the change-of-value update to the base unit at regular intervals according to instructions programmed into the controller 202.

1299. Thus, for at least the reasons detailed above, Kates discloses that the automation component identified in the alternate embodiment analysis for claim 1 (i.e., sensor unit 802) also satisfies the additional limitation of wherein the change-of-value update is automatically communicated of claim 5.

iv.Claim 17

1300. Claim 17 of the ’371 Patent recites:

> A method of communicating information between automation components operating within a building automation system, the method comprising:
>
> receiving a plurality of change-of-value messages from a plurality of wireless devices, each of the plurality of change-of-value messages representing a wireless device indication;
>
> storing the received change-of-value messages according to the corresponding wireless device of the plurality of wireless devices; and
>
> communicating a change-of-value update that includes the plurality of change-of-value messages, and repeating the change-of-value update at regular intervals according to a schedule or until a change-of-value acknowledgment is received.

1301. Claim 17 of the ’371 Patent claims a method of communicating information between automation components in a wireless building automation control system. This method claims communication with a plurality of devices, each with a change-of-value message, store that change-of-value message with a device identifier, and communicate the plurality of change-of-value messages with other automation components, at a schedule or until a change-of-value acknowledgement is received.

1302. As detailed in an element-by-element analysis below, every limitation of claim 17 of the '371 patent is disclosed, or at least rendered obvious to a POSITA in view of Kates.

a. **17[pre] A method of communicating information between automation components operating within a building automation system, the method comprising:**

1303. To the extent that the preamble is limiting, Kates discloses or renders obvious to a POSITA a method for communicating between automation components operating within a building automation system, as discussed below.

1304. More specifically, Kates discloses a building automation system comprising several types of wireless automation devices, for example, Kates describes "[a] low cost, robust, wireless sensor system that provides an extended period of operability without maintenance" (Kates, Abstract). Moreover, Kates discloses a system for autonomous monitoring of anomalous conditions which performs alarm functionality in the event that such a condition is detected (*see,* e.g,. Kates, Abstract). Kates additionally discloses "[i]n one embodiment, the sensor unit is bi-directional and configured to receive instructions from the central reporting station (or repeater). Thus, for example, the central reporting station can instruct the sensor to: perform additional measurements, go to a standby mode, wake up; report battery status, change wake-up interval, run self-diagnostics and report results, etc." (Kates, [0008]). The bi-directional, wireless repeater units of Kates which can receive and follow instructions constitute automation components capable of performing the communications method as claimed for claim elements 17[a] through 17[c] configured for wireless communication within a building automation system.

1305. In more detail, Figure 1 of Kates (reproduced below) shows a wireless sensor system that includes several remote sensor units 102-106 that are able to wirelessly communicate with the base unit 112 via one or more repeaters 110. As shown in Figure 1 of Kates, the monitoring computer

system 113 is coupled on one side to a local computer network connection (not displayed) to which several example sensor systems are also coupled on the other via repeater units 110 and 111, and this network connection may take on one of several types, "such as, for example, Ethernet, wireless Ethernet, firewire port, Universal Serial Bus (USB) port, Bluetooth, etc." (Kates, [0029]). Thus, Kates discloses a wireless sensor system configured as a building automation system wherein repeater units 110, 111constitute automation components configured for wireless communications.

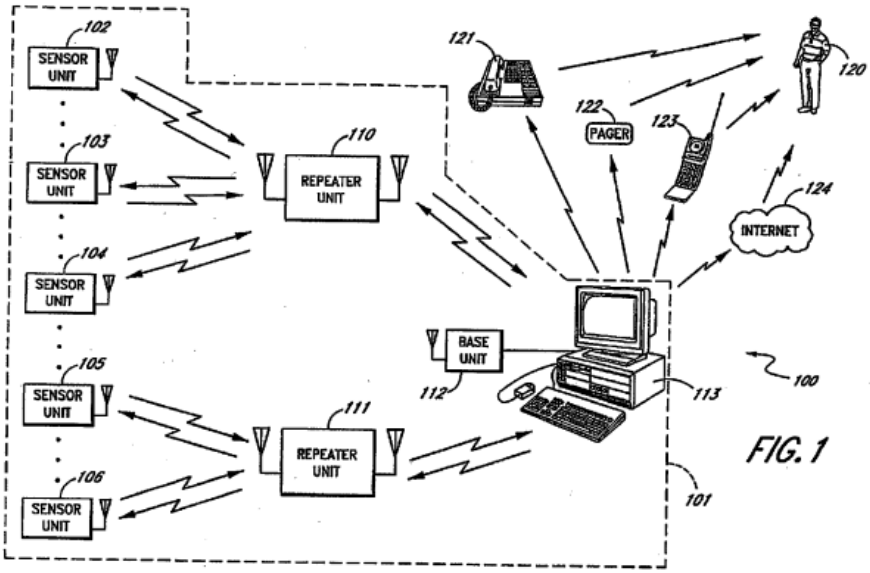


Figure 1 of Kates.

1306. Consequently, for at least the reasons above, to the extent that the preamble of claim 17 of the '371 patent is limiting, it is my opinion that Kates discloses the requirements of this preamble.

b. **17[a] receiving a plurality of change-of-value messages from a plurality of wireless devices, each of the plurality of change-of-value messages representing a wireless device indication;**

1307. As discussed for the preamble of 17, Kates discloses as automation component configured for wireless communications (i.e., repeater units 110, 111) within a building automation system, for example Kates describes "[a] low cost, robust, wireless sensor system that provides an extended period of operability without maintenance" (Kates, Abstract). Kates additionally discloses "[i]n

one embodiment, the sensor unit is bi-directional and configured to receive instructions from the central reporting station (or repeater). Thus, for example, the central reporting station can instruct the sensor to: perform additional measurements, go to a standby mode, wake up; report battery status, change wake-up interval, run self-diagnostics and report results, etc." (Kates, [0008]). More specifically, figure 1 of Kates "shows a sensor system 100 that includes a plurality of sensor units 102-106 that communicate with a base unit 112 through a number of repeater units 110-111" (Kates, [0029]) and an embodiment wherein "[t]he base unit 112 communicates with a monitoring computer system 113 through a computer network connection such as, for example, Ethernet, wireless Ethernet, firewire port, Universal Serial Bus (USB) port, bluetooth, etc." (Kates, [0029]).

1308. Furthermore, figure 3 of Kates (reproduced below) shows that the repeater units therein include "a first transceiver 302" and "a second transceiver 304" with corresponding antennas (301 and 305 respectively). More specifically, Kates discloses "FIG. 3 is a block diagram of the repeater unit 110. In the repeater unit 110, a first transceiver 302 and a second transceiver 305 are provided to a controller 303" (Kates, [0054]).

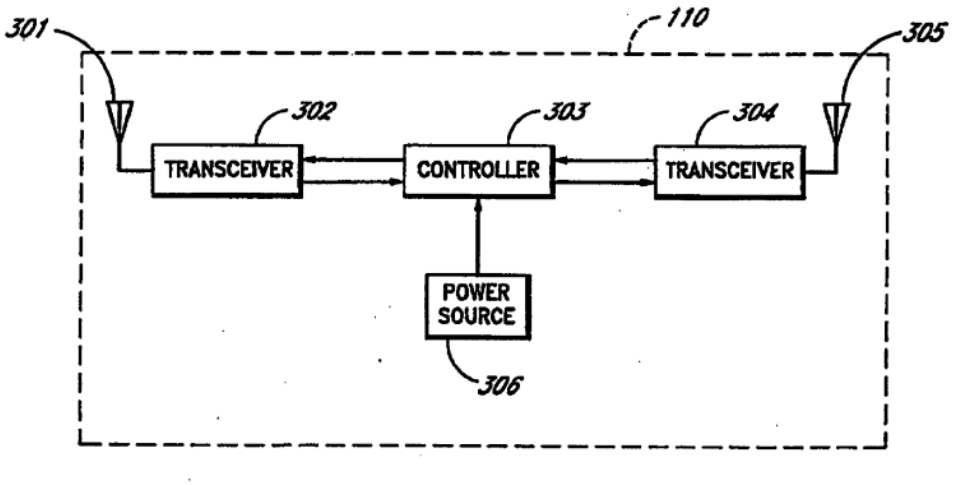


FIG. 3

Figure 3 of Kates

1309. As discussed above, Kates discloses a wireless automation component (i.e., repeater unit 110) comprising a processor in communication with a wireless communications component (i.e., transceiver 302, 304). Kates also discloses that that "the repeater 110 is configured to receive instructions from the base unit 112. Thus, for example, the base unit 112 can instruct the repeater to: send commands to one or more sensors; go to standby mode; 'wake up'; report battery status; change wake-up interval; run self-diagnostics and reports results; etc." (Kates, [0045]). Furthermore, "the repeater unit 110 is configured to provide bi-directional communication between its sensors and the base unit 112" (Kates, [0034]). Thus, the repeater unit described above is in wireless communications with the base unit, which may send instructions to the repeater unit to act upon, such as those necessary to relay information between the base and unit and sensor units. Therefore, the repeater unit may be configured to receive and store computer readable instructions from the base unit.

1310. As discussed above, Kates discloses that the repeater automation component comprises a memory in communication with a processor. Additionally, Kates discloses that the memory can store computer readable instructions that may be programmed to process a change-of-value request message received via the wireless communications component. More specifically, Kates states that "the sensor unit 102 provides bi-directional communication and is configured to receive data and/or instructions from the base unit 112. Thus, for example, the base unit 112 can instruct the sensor unit 102 to perform additional measurements, to go to a standby mode, to wake up, to report battery status, to change wake-up interval, to run self-diagnostics and report results, etc." (Kates, [0034]). In another embodiment, "the central reporting station can instruct the repeater to: send commands to one or more sensors, go to standby mode, "wake up", report battery status, change wake-up interval; run self-diagnostics and report results, etc." (Kates, [0012]). By combining this functionality with the power saving functionality of Kates with a repeater between a base unit and sensor unit, a POSITA would recognize that the repeater would be able to receive and process instructions from the base unit to send commands to sensor units, which would then be able to provide the repeater with change-of-value updates.

1311. In more detail, Kates discloses that "[i]n order to conserve battery power, the sensor is normally placed in a low-power mode," and "while in the low power mode, the sensor unit takes regular sensor readings and evaluates the readings to determine if an anomalous condition exists" (Kates, [0033]). In the invention of Kates, upon evaluation of the readings, "[i]f an anomalous condition is detected, then the sensor unit 'wakes up' and begins communicating with the base unit or with a repeater" (Kates, [0033]). Broadly, the power saving functionality demonstrates that the teachings of Kates allows for automation components comprising sensors to conserve battery life by only checking the values of sensors at regularly defined intervals, which occur at "programmed

intervals," at which "the sensor unit 102 also 'wakes up' and sends status information (e.g., power levels, self[-]diagnostic information, etc.) to the base unit (or repeater) and then listens for commands for a period of time" (Kates, [0033]).

1312. In order for the anomalous detection to be communicated from the sensor unit 102, such an anomaly must be detected, which would require the identification of sensor values when it takes readings, and an evaluation of those readings against a set of criteria that would determine if the reading was, in fact, anomalous. Kates explicitly discloses this functionality, namely that "[t]he controller 202 receives sensor data from the sensor(s) 201," and "the controller 202 evaluates the sensor data by comparing the data value to a threshold value (e.g., a high threshold, a low threshold, or a high-low threshold). If the data is outside the threshold (e.g., above a high threshold, below a low threshold, outside an inner range threshold, or inside an outer range threshold), then the data is deemed to be anomalous and is transmitted to the base unit 112" (Kates, [0052]), or via a repeater unit 111. A POSITA would understand that the high-low threshold "outside an inner range threshold" would correspond with change-of-value threshold to provide a change-of-value update within the building automation system of Kates.

1313. More specifically, it would be known to a POSITA that there is a finite number of threshold choices available for such an application: (1) a high threshold (i.e., above a high threshold); (2) a low threshold (i.e., below a low threshold); (3) within a range of values (i.e., outside an inner range threshold); (4) not within a range of values (i.e., inside an outer range threshold); and (5) a combination of the previous options. Moreover, a POSITA would understand that the threshold choice above could be applied to *absolute* values (i.e., fixed, predetermined thresholds) or to *relative* values (i.e., thresholds that depend on the previous or current measured values). Indeed, it is obvious to a POSITA that one criterion that grants the benefits of Kates—i.e., reduced

transmission energy usage by selective determination of when to transmit data—could be implemented using a relative application of choice (4) such that data is only transmitted when a meaningful change occurs. This would, for example, increase the battery life of a temperature sensor by preventing repeated transition of the same temperature when a room's temperature is stable; because an HVAC system only needs to act when temperature changes, there is no need for a constant temperature to be repeatedly transmitted and thus the system of Kates achieves its goal of reducing transmission of data without effecting how the HVAC system operates.

1314. In more detail, to effectively determine when a sensor reading has changed from that of a previous reading, it would be obvious to a POSITA that a small inner range threshold would be used. For example, if a temperature has a set point of a certain value, an inner range threshold criteria could be plus or minus one degree. Thus, if a temperature reading within a room within a building is taken that falls outside of this narrow range, then the system would detect a change-of-value from the set point, and the condition would be reported to the base unit or via a repeater to maintain the system to operate as intended. As such, a POSITA would be motivated to implement the inner range threshold from Kates as a change-of-value threshold to determine if a change-of-value has occurred. In other words, using the inner range threshold criteria to send an alert if a measurement is outside a predefined range, which would be obvious to a POSITA interested in maintaining a system at particular sensor reading values while checking readings periodically, in view of Kates's emphasis on energy efficiency. As such, the sensor units of Kates would be able to provide sensor value information or a change-of-value update based upon a requested sensor reading to a repeater unit if requested.

1315. More specifically, Kates discloses "[i]n one embodiment, the repeater is configured to provide bi-directional communication between one or more sensors and a base unit. In one

embodiment, the repeater is configured to receive instructions from the central reporting station (or repeater). Thus, for example, the central reporting station can instruct the repeater to: send commands to one or more sensors, go to standby mode, "wake up", report battery status, change wake-up interval; run self-diagnostics and report results, etc." (Kates, [0012]). It would therefore be clear to a POSITA that the repeater units of Kates would be able to receive instructions from a base unit (e.g., a change-of-value update request) and relay the request to one or more sensor units to provide a new sensor value reading or change-of-value update.

1316. As discussed above, a repeater automation component of Kates can receive and process a change-of-value request message from a base unit. Further, upon receipt of the change-of-value request message, the repeater can "send commands to one or more sensors, go to standby mode, "wake up", report battery status, change wake-up interval; run self-diagnostics and report results, etc." (Kates, [0012]). Among the commands that sensor unit may receive include "to perform additional measurements, to go to a standby mode, to wake up, to report battery status, to change wake-up interval, to run self-diagnostics and report results, etc." (Kates, [0034]). It would be recognized by a POSITA that when the sensor unit receives a message with instructions to perform additional measurements, it would perform sensor readings and communicate the readings to the sensor unit controller, at which point "the controller 202 evaluates the sensor data by comparing the data value to a threshold value (e.g., a high threshold, a low threshold, or a high-low threshold). If the data is outside the threshold (e.g., above a high threshold, below a low threshold, outside an inner range threshold, or inside an outer range threshold), then the data is deemed to be anomalous and is transmitted to the base unit 112" (Kates, [0052]). As further described above, a sensor unit would be able to process a change-of value according to the high-low threshold "outside an inner

range threshold" threshold to provide a change-of-value update to the repeater unit within the building automation system of Kates.

1317. Kates further discloses that the repeater can communicate with one or more (i.e., a plurality of) sensor units, where such sensor units are wireless devices (See Kates, Abstract, [0050], [0051]). In more detail, Kate discloses "[t]he repeater unit is configured to relay communications traffic between a number of sensor units and the base unit" (Kates, [0011]). In more detail, Kates discloses that "[t]he base unit is configured to receive measured sensor data from a number of sensor units" and that "the sensor information is relayed through the repeater units" (Kates, [0013]). As previously described above, the circuitry within the sensor unit would be able to process a change-of-value from a previous reading value by the change-of-value threshold (i.e., sensor information) discussed, which it could then provide to the repeater unit. As this change-of-value update functionality can be performed for at least each sensor unit within a repeater unit's database, it would be readily apparent to a POSITA that the repeater unit can receive a plurality of change-of-value messages each from a plurality of devices, and further that each change-of-value message would represent a wireless device indication.

1318. Upon receiving a plurality of change-of-value messages from a plurality of sensor devices, it would be straightforward for a POSITA to further program the repeater unit to receive, store, and process the plurality of change-of-value updates before communicating a change-of-value message back to the base unit. Indeed, Kates explains that controller 303 of the repeater unit "receives data from the first transceiver 303 and provides the data to the second transceiver 304," and, "[w]hen relaying instructions from the base unit 112 to a sensor unit, the controller 303 receives data from the second transceiver 304 and provides the data to the first transceiver 302." (Kates, [0055]). Thus, Kates expressly discloses receiving information from,

e.g., one or more sensor units via one transceiver, and the controller controlling the retransmission of that that information to the base unit via another transceiver. It would be straightforward for a POSITA to program the repeater to, e.g., collect, combine or aggregate the information received from the sensor units before transmission to the base unit. This functionality would be motivated by Kates's focus on energy efficiency of the building automation system; that is, a POSITA would be motivated to program the repeater and sensor units to communicate at regular intervals to save battery life of the repeater, sensor, and base units. In other words, it would be straightforward to instruct the repeater to request change-of-value updates from a plurality of sensor units but wait until all change-of-value messages are received prior to communicating back to the base unit, allowing the sensor and repeaters units to maintain their low power functionalities and minimizing the number of data transmissions between the repeater and base unit.

1319. Thus, for at least the reasons disclosed above, Kates discloses a wireless automation component (i.e., repeat unit) that can receive a plurality of change-of-value messages from a plurality of wireless devices (i.e., sensor units), each of the plurality of change-of-value messages representing a wireless device indication, as required by claim element 17[a] of the '371 patent.

c. **17[b] storing the received change-of-value messages according to the corresponding wireless device of the plurality of wireless devices; and**

1320. The limitations of claim element 17[c] of the '371 patent are disclosed by Kates for at least the reasons described below. As discussed above, Kates discloses a wireless automation component (i.e., repeater unit 110) comprising a processor in communication with a wireless communications component (i.e., transceiver 302, 304). Kates explains that controller 303 "typically provides power, data, and control information to the transceivers 302, 304." (Kates, [0054]). Kates further explains that controller 303 "receives data from the first transceiver 303 and provides the data to the second transceiver 304," and, "[w]hen relaying instructions from the base

unit 112 to a sensor unit, the controller 303 receives data from the second transceiver 304 and provides the data to the first transceiver 302." (Kates, [0055]). Kates further explains that "[t]he controller 303 also monitors the power source 306 and provides status information, such as, for example, self-diagnostic information and/or information about the health of the power source 306, to the base unit 112," where, "[i]n one embodiment, the controller 303 sends status information to the base unit 112 at regular intervals." (Kates, [0055]). Further, "[i]n one embodiment, the controller 303 sends status information to the base unit 112 when requested by the base unit 112." (Kates, [0055]; see also Kates, [0056]-[0057]). Kates further states "[t]he repeater units typically operate in an environment with several other repeater units and thus each repeater unit contains a database (e.g., a lookup table) of sensor IDs" (Kates, [0011]). Thus, ta POSITA would recognize that the repeater units contain memory for storing instructions and data.

1321. As discussed for claim element 17[a], the repeater of Kates may be programmed by a POSITA to receive a plurality of change-of-value update messages from the sensor units saved into its database of sensor IDs in response to the change-of-value message request from the base unit as described and compile the plurality of sensor messages into a single change-of-value message for communication back to the base unit. It would therefore be clear to a POSITA that in order to compile a plurality of change-of-value update messages, the memory in communication with the processor of the repeater unit could be configured to store, at least temporarily, the received change-of-value messages received from the plurality of wireless sensor units.

1322. Thus, for at least the reasons disclosed above, Kates discloses a wireless automation component (i.e., repeat unit) that can store the received change-of-value messages according to the corresponding wireless device of the plurality of wireless devices (i.e., sensor units), as required by claim element 17[b] of the '371 patent.

d. **17[c] communicating a change-of-value update that includes the plurality of change-of-value messages, and repeating the change-of-value update at regular intervals according to a schedule or until a change-of-value acknowledgment is received.**

1323. The limitations of claim element 17[c] of the '371 patent are disclosed by Kates for at least the reasons described below.

1324. As discussed for claim element 17[a], the repeater of Kates may be programmed by a POSITA to receive and store a plurality of change-of-value update messages from the sensor units saved into its database of sensor IDs in response to the change-of-value message request from the base unit and compile the plurality of sensor messages into a single change-of-value message for communication back to the base unit. Kates additionally discloses methods in which this compiled change-of-value update can be communicated back to the base unit, namely at regular intervals according to a schedule. In more detail, Kates explicitly discloses "[i]n one embodiment, the controller 303 sends status information to the base unit 112 at regular intervals" (Kates, [0055]). It would be clear to a POSITA that such status information could comprise repeater health or sensor information as requested by the repeater unit, including sensor value data or change-of-value updates from each sensor in wireless communications with the repeater.

1325. Alternatively, another method for the communication of the change-of-value update message from the repeater to the base unit disclosed by Kates is to wait until a change-of-value acknowledgment is received. More specifically, Kates discloses that "[i]n one embodiment, the sensor continues to transmit data until it receives an acknowledgement from the base unit that the message has been received" (Kates, [0038]). It would be obvious to a POSITA to apply this functionality to the repeater unit in addition to the sensor units. Alternatively, as a relay unit, the repeater unit could forward an acknowledgement from the base unit to the sensor units, as described in Kates, which recites: "[i]n one embodiment, the sensor unit transmits sensor data until

a handshaking-type acknowledgement is received. Thus, rather than sleep [i]f no instructions or acknowledgements are received after transmission (e.g., after the decision block 613 or 709) the sensor unit 102 retransmits its data and waits for an acknowledgement. The sensor unit 102 continues to transmit data and wait for an acknowledgement until an acknowledgement is received. In one embodiment, the sensor unit accepts an acknowledgement from a repeater unit 111 and it then becomes the responsibility of the repeater unit 111 to make sure that the data is forwarded to the base unit 112" (Kates, [0065]). Therefore, a POSITA would recognize that repeater would be able to communicate the change-of-value update of claim element 17[a] until a change-of-value acknowledgment is received from the base unit.

1326. Thus, for at least the reasons disclosed above, Kates discloses that repeater units disclose the functionality of communicating a change-of-value update that includes the plurality of change-of-value messages, and repeating the change-of-value update at regular intervals according to a schedule or until a change-of-value acknowledgment is received, as required by claim element 17[c] of the '371 patent.

v.Claim 19

1327. Claim 19 of the '371 Patent recites:

> The method of claim 17, wherein each of the plurality of the change-of-value messages includes the change-of-value and a device indicator.

1328. Claim 19 of the '371 depends upon claim 17 therein and includes additional limitations pertaining to the plurality of change-of-value messages. For at least the reasons detailed above in relation to claim 17, it is my opinion that Kates discloses each and every limitation of claim 17 of the '371 patent; and, for at least the reasons below, it is my opinion that Kates also renders obvious the limitation added by claim 19.

1329. As discussed for claim 17, the repeater of Kates may be programmed by a POSITA to receive and store a plurality of change-of-value update messages from the sensor units saved into its database of sensor IDs in response to the change-of-value message request from the base unit and compile the plurality of sensor messages into a single change-of-value message for communication back to the base unit. Kates additionally discloses methods in which this compiled change-of-value update can be communicated back to the base unit, namely at regular intervals according to a schedule. In more detail, Kates explicitly discloses "[i]n one embodiment, the controller 303 sends status information to the base unit 112 at regular intervals" (Kates, [0055]). It would be clear to a POSITA that such status information could comprise repeater health or sensor information as requested by the repeater unit, including sensor value data or change-of-value updates from each sensor in wireless communications with the repeater.

1330. Additionally, the power saving functionality demonstrates that the teachings of Kates allows for automation components comprising sensors (i.e., sensor units) to conserve battery life by only checking the values of sensors at regularly defined intervals, which occur at "programmed intervals," at which "the sensor unit 102 also 'wakes up' and sends status information (e.g., power levels, self[-]diagnostic information, etc.) to the base unit (or repeater) and then listens for commands for a period of time" (Kates, [0033]). It would be clear to a POSITA that this status information, such as power levels or self-diagnostic information, may be communicated to the repeater unit in addition to the requested change-of-value update, providing device indication information, such as whether the sensor device is in a low-power state.

1331. Consequently, for at least the reasons above, Kates discloses a method of communication of claim 17, that may be performed by its repeater automation component, wherein the change-of-

value message includes device indicator information for each of the plurality of wireless sensor devices, as required by claim 19 by the ’371 patent.

D. Claims 1, 4, and 5 are anticipated or obvious to a POSITA in view of Helgeson

i. Claim 1

1332. Claim 1 of the ’371 Patent recites:

> An automation component configured for wireless communication within a building automation system, the automation component comprising:
>
> a wireless communications component;
>
> a processor in communication with the wireless communications component;
>
> a memory in communication with the processor, the memory configured to store computer readable instructions which are executable by the processor; wherein the computer readable instructions are programmed to:
>
> process a change-of-value request message received via the wireless communications component;
>
> generate a change-of-value update in response to the change-of-value request message, wherein the change-of-value update includes a plurality of change-of-value messages received from a plurality of devices; and
>
> communicate the change-of-value update via the wireless communication component at regular intervals according to a schedule or until a change-of-value acknowledgment is received.

1333. Claim 1 of the ’371 Patent claims an automation component for a wireless building automation control system comprising a processor, wireless communications, and memory that includes computer-readable instructions. This automation component is able to generate and process a change-of-value request and receive messages from a plurality of devices. This unit is

also able to create and send messages to other components of the system at regular intervals or until receiving an acknowledgement.

1334. As detailed in an element-by-element analysis below, every limitation of Claim 1 is disclosed, or at least anticipated or rendered obvious to a POSITA in view of Helgeson.

a. **1[pre] An automation component configured for wireless communication within a building automation system, the automation component comprising:**

1335. To the extent that the preamble of claim 1 of the '371 Patent is limiting, Helgeson discloses an automation component configured for wireless communication within a building automation system, as discussed below.

1336. Helgeson discloses a wireless automation device, for example Helgeson describes "building monitoring and control systems that includes bi-directional radio frequency links" (Helgeson, Abstract). Moreover, Helgeson discloses a system for autonomous monitoring of anomalous conditions which performs alarm verification functionality in the event that such a condition is detected (*see, e.g.,* Helgeson, Abstract). Helgeson additionally discloses "[t]he system can include at least one master unit and a plurality of remote units, the remote units being typically couple to sensors for measuring and/or controlling security or building environmental variables" (Helgeson, [0011]). The bi-directional, wireless remote units of Helgeson which can receive and follow instructions constitute automation components configured for wireless communication within a building automation system.

1337. More specifically, figure 1 of Helgeson (reproduced below), shows wireless master and remote units that comprise the building automation system of Helgeson. In more detail, Helgeson states "FIG. 1 illustrates a wireless control system 20 including a master unit 22 and two wireless remote units 24 and 25. Master unit 22 includes an antenna 26, a power supply line 28, annunciator

panel output line 30, alarm device output line 32, and telephone line 34. A building monitoring and/or control system according to the present invention typically has at least one master unit which is commonly powered with AC line power but can be battery powered, or have battery back-up power" (Helgeson, [0023]). In addition to the master unit 22 having an antenna for wireless communications, the remote units 24 and 25 also include an antenna 23. Thus, Helgeson discloses a wireless sensor system configured as a building automation system wherein remote sensor units 24, 25 constitute automation components configured for wireless communications.

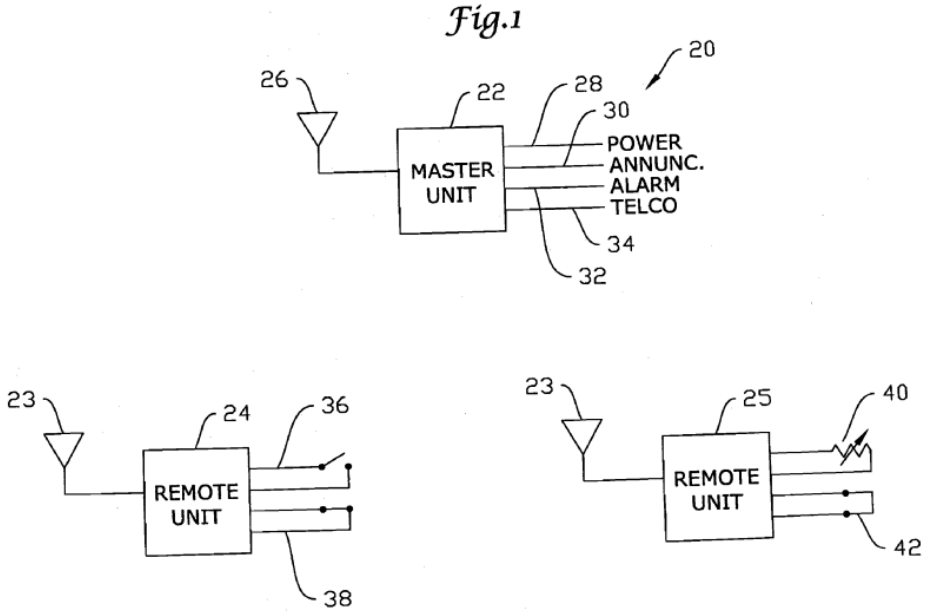


Figure 1 of Helgeson

1338. Consequently, for at least the reasons above, to the extent that the preamble of claim 1 of the '371 patent is limiting, it is my opinion that Helgeson discloses the requirements of this preamble.

b. **1[a] a wireless communications component;**

1339. The limitations of claim element 1[a] of the '371 Patent are disclosed or rendered obvious to a POSITA by Helgeson for at least the reasons described below.

1340. As discussed for claim element 1[pre], Helgeson discloses an automation component configured for wireless communications (i.e., remote units 24, 25), for example Helgeson describes "building monitoring and control systems that includes bi-directional radio frequency links" (Helgeson, Abstract). More specifically, figure 2 of Helgeson (reproduced below) shows "a remote unit 50 is illustrated in further detail, including antenna 23, a transceiver 52, and a controller 54" (Helgeson, [0026]). Helgeson details a system comprised of "a number of remote units which can spread over an area covered by the RF communication" (Helgeson, [0025]) and further discloses that the "[t]ransceiver is preferably a UHF transceiver, for example transmitting and receiving in the 400 or 900 MHz range" (Helgeson, [0026]).

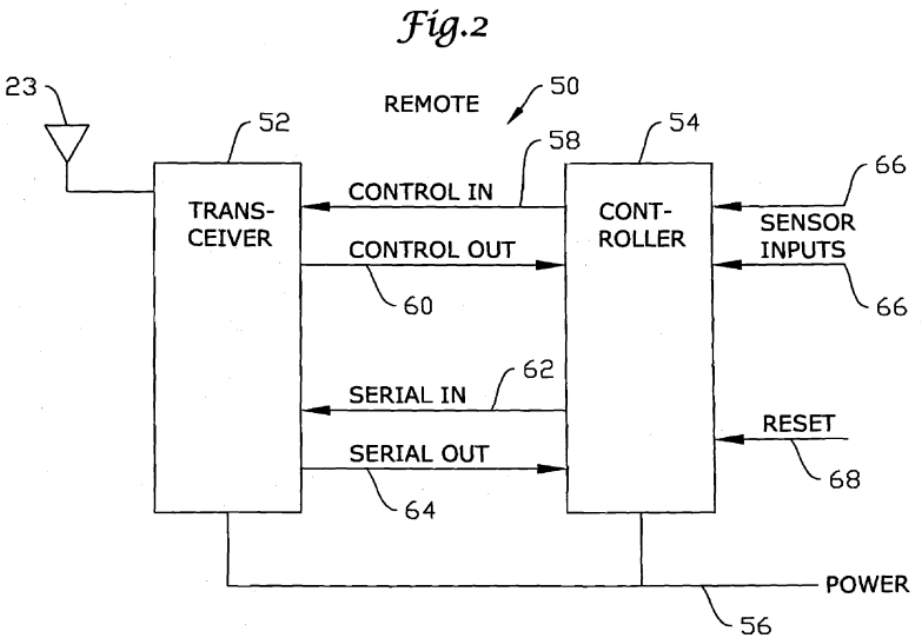


Figure 2 of Helgeson

1341. Thus, for at least the reasons detailed above, Helgeson discloses that the automation component identified in the analysis for the preamble of claim 1 (i.e., remote unit 24, 25) also satisfies the additional limitation of comprising a wireless communications component of claim 1[a].

c. **1[b] a processor in communication with the wireless communications component;**

1342. The limitations of claim element 1[b] of the ’371 Patent are disclosed or rendered obvious to a POSITA by Helgeson for at least the reasons described below.

1343. As discussed for claim element 1[a], Helgeson discloses a wireless automation device (i.e., remote unite 24) comprising at least one wireless communications component (i.e., transceiver 52). Helgeson further discloses that this automation component further comprises a processor in communication with the wireless communications component. More specifically, in a description of figure 2 of Helgeson, Helgeson states that “[i]n the embodiment illustrated, controller 54 is coupled to transceiver 52 with control input line 58, control output line 60, serial input line 62, and serial output line 64” (Helgeson, [0026]), and also that “[c]ontroller 54 includes a programable microprocessor such as the PIC microprocessor in one embodiment. In another embodiment, the controller is formed primarily of a once-programmable or writeable state machine” (Helgeson, [0026]). Therefore, it would be clear to a POSITA that the controller 54 in a remote unit of Helgeson would be in communication with a wireless communications component (i.e., transceiver 52), and that Helgeson consequently discloses the requirements of claim element 1[b] of the ’371 patent.

d. **1[c] a memory in communication with the processor, the memory configured to store computer readable instructions which are executable by the processor; wherein the computer readable instructions are programmed to:**

1344. The limitations of claim element 1[c] of the ’371 Patent are disclosed by Helgeson for at least the reasons described below.

1345. As discussed for claim element 1[b], Helgeson discloses a wireless automation component (i.e., remote unit 24) comprising a processor in communication with a wireless communications

component (i.e., transceiver 52). Helgeson renders obvious to a POSITA that this wireless automation device further comprises a memory in communication with the processor, the memory configured to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor. For example, when describing figure 2, Helgeson states that "[c]ontroller 54 includes a programable microprocessor such as the PIC microprocessor in one embodiment. In another embodiment, the controller is formed primarily of a once-programmable or writeable state machine" (Helgeson, [0026]). It would be well-known to a POSITA that a peripheral interface controller (PIC) microprocessor comprised memory, such as mask ROM, EEPROM, or flash memory. A POSITA would recognize any of these memory options is utilized to store programing for execution by the processor, as well as information utilized by the processor, at least because mask ROM, embedded EEPROM, or flash memory is typically used in microprocessor systems for these purposes.

1346. The storage of sensor data provided by the sensor inputs 66 within the non-volatile memory of the controller 54 is inherent in the remote sensor units, since these units convert the analog signals from sensors into digital signals for RF transmission, which a POSITA would understand requires storage of the sensor data, at least temporarily, within a cache or other memory within the sensor unit. More specifically, a POSITA would recognize that the flash EEPROM memory within a sensor module is a convenient memory in which to store sensor data after this has been derived from analog sensor data and before it has been transmitted by the RF communication system. Moreover, a POSITA would understand that such storage is required since there is no guarantee that a transmission will occur exactly when data is acquired and thus storage of the sensor data is necessary at least until it is transmitted. This functionality is explicitly disclosed by Helgeson, which recites: "sensor data is included in the TRANSMITTING HEALTH transmission. For

example, in a room temperature sensor, the temperature can be transmitted as part of the health or status message. In this way, the periodic message used to insure that the remote unit is still functioning can also be used to log the current data from the sensors" (Helgeson, [0040], emphasis added).

1347. Moreover, Helgeson describes processes and algorithms that may be performed by the processor of the control unit, which constitute computer-readable instructions stored in the memory associated with the processor. More specifically, Helgeson explicitly describes a process that is executable on a remote unit, wherein "initialization steps can be executed, such as performing diagnostics, clearing memory, initializing counters, and timers, and initializing variables" (Helgeson, [0034]). More broadly, figures 4, 5, and 6 of Helgeson provide processes (i.e., algorithms) that may execute on a remote unit, describing processes for typical operation, arming or disarming the unit, and handling confirmation requests by the master unit, respectively. Furthermore, Helgeson states "[i]n one mode, the transceiver operates in a very low power "sleep mode", wherein the transceiver is neither transmitting nor receiving. The transceiver can be awakened from the sleep mode by external control signals, such as provided by control lines coming from the control logic portion of the remote unit. In one embodiment of the invention, only the controller can change the state of the transceiver through the control lines such as control lines 58 and 60 in FIG. 2" (Helgeson, [0031]). It would therefore be clear to a POSITA that the memory in communication with the controller 54 stores computer-readable instructions (i.e., control logic) which are executable by the controller 54.

1348. Therefore, for at least the reasons above, it would be clear to a POSITA that memory is in communication with the controller 54 of Helgeson, and that the controller and its associated memory may be programmed to store sensor data provided by the sensor inputs 66 and computer

readable instructions (i.e., control logic) which are executable by the processor, and that Helgeson consequently discloses the requirements of claim element 1[c] of the ’371 patent.

e. **1[d] process a change-of-value request message received via the wireless communications component;**

1349. The limitations of claim element 1[d] of the ‘371 Patent are disclosed by Helgeson for at least the reasons described below.

1350. As discussed for claim element 1[c], Helgeson discloses that the remote unit automation component comprises a memory in communication with a processor. Additionally, Helgeson discloses that the memory can store computer readable instructions that may be programmed to process a change-of-value request message received via the wireless communications component.

1351. The power saving functionality of Helgeson, in which remote units typically operate in a low power mode to save battery life, provide a straightforward approach to detecting anomalous conditions or changes of values of a sensor. As an example, Helgeson describes that “a temperature sensor may be configured to transmit every half-hour or upon a one (1) degree change from the last transmission. This can greatly reduce power consumption” (Helgeson, [0032]). Thus, by programming the control logic executable by the controller 54 such that the remote unit is able to distinguish a one degree change from the most recent prior transmission, a POSITA would recognize this to constitute a change-of-value update.

1352. More specifically, it would be known to a POSITA that there is a finite number of threshold choices available for such an application: (1) a high threshold; (2) a low threshold; (3) within a range of values; (4) not within a range of values; and (5) a combination of the previous options. Moreover, a POSITA would understand that the threshold choice above could be applied to absolute values—i.e., fixed, predetermined thresholds—or to relative values—i.e., thresholds that depend on the previous or current measured values. Indeed, it is obvious to a POSITA that one

criterion that grants the benefits of Helgeson—i.e., reduced transmission energy usage by selective determination of when to transmit data—could be implemented using a relative application of choice (4) such that data is only transmitted when a meaningful change occurs. This would, for example, increase the battery life of a temperature sensor by preventing repeated transition of the same temperature when a room's temperature is stable; because an HVAC system only needs to act when temperature changes, there is no need for a constant temperature to be repeatedly transmitted and thus the system of Helgeson achieves its goal of reducing transmission of data without effecting how the HVAC system operates.

1353. In more detail, to effectively determine when a sensor reading has changed from that of a previous reading, it would be obvious to a POSITA that a small inner range threshold would be used. For example, if a temperature has a set point of a certain value, an inner range threshold criteria could be plus or minus one degree. Thus, if a temperature reading within a room within a building is taken that falls outside of this narrow range, then the system would detect a change-of-value from the set point, and the condition would be reported to the master unit to maintain the system to operate as intended. As such, a POSITA would be motivated to implement the inner range threshold from Helgeson as a change-of-value threshold to determine if a change-of-value has occurred. In other words, using the inner range threshold criteria to send an alert if a measurement is outside a predefined range, which would be obvious to a POSITA interested in maintaining a system at particular sensor reading values while checking readings periodically, in view of Helgeson's emphasis on energy efficiency. As such, the remote sensor units of Helgeson would be able to provide sensor value information (i.e., sensor data) or a change-of-value update based upon a requested sensor reading to a repeater unit if requested.

1354. More specifically, Helgeson discloses that "[i]n one embodiment, a WAITING FOR POLL state 116 can be entered, and the transceiver is set to a receive state at a receive frequency. In this embodiment, the remote does not transmit health status until polled by the master unit" (Helgeson, [0037]). It would therefore be clear to a POSITA that the remote unit 54 of Helgeson would be able to receive instructions from the master unit (e.g., a change-of-value update request) and therefore process the change-of-value update request, via the wireless communications component in communication with the processor as detailed for claim elements 1[a] and 1[b].

1355. Consequently, for at least the reasons above, Helgeson discloses memory in communication with the processor, configured to process a change-of-value request message received via the wireless communications component, as required by the 1[d] claim by '371 patent.

f. **1[e] generate a change-of-value update in response to the change-of-value request message, wherein the change-of-value update includes a plurality of change-of-value messages received from a plurality of devices; and**

1356. The limitations of claim element 1[e] of the '371 patent are disclosed by Helgeson for at least the reasons described below.

1357. As discussed for claim element 1[d], a remote sensor automation component of Helgeson can receive and process a change-of-value request message from a master base unit. Further, upon receipt of the change-of-value request message (i.e., a POLL REQUEST 117 from the master unit), the remote unit can "transition to a TRANSMITTING HEALTH state 118" (Helgeson, [0038]), in which "sensor data is included in the TRANSMITTING HEALTH transmission" (Helgeson, [0040]). It would be recognized by a POSITA that when the remote unit receives a message with instructions to perform additional measurements, it would perform sensor readings and process the readings via the remote unit controller, at which point it would begin to "TRANSMIT HEALTH" which, as previously discussed, indicates that "sensor data is included in the TRANSMITTING

HEALTH transmission. For example, in a room temperature sensor, the temperature can be transmitted as part of the health or status message" (Helgeson, [0040]). As further described for claim element 1[d], a sensor unit would be able to process a change-of value according to the "within a range threshold" from the received sensor data to provide a change-of-value update to the master unit within the building automation system of Helgeson.

1358. Helgeson further discloses that the remote can communicate with one or more sensor inputs (i.e., plurality of devices). In more detail, Helgeson discloses "[i]n some embodiments, each type of security sensor type is given a weight and a total weight threshold must be crossed before an alarm is reported. For example, a motion detector and either a door opening or a window opening is required to report an intrusion, or at least two different motion detectors must be tripped before an alarm is reported to a central agency" (Helgeson, [0052]). As previously described above, the circuitry within the sensor unit would be able to process a change-of-value from a previous reading value by the change-of-value threshold (i.e., sensor input data) discussed in claim element 1[d], which it could then provide to the repeater unit. As this change-of-value update functionality can be performed for at least each sensor input connected to a remote unit, it would readily apparent to a POSITA that the remote unit can receive a plurality of change-of-value readings received from a plurality of devices.

1359. Upon receiving a plurality of change-of-value messages from a plurality of sensor devices, it would be straightforward for a POSITA to further program the remote unit to receive and process a plurality of change-of-value updates before communicating a change-of-value message back to the master unit. This functionality would be motivated by Helgeson's focus on energy efficiency of the building automation system; that is, a POSITA would be motivated to program the remote units to communicate at regular intervals to save battery life. In other words, it would be

straightforward to instruct the remote unit to request change-of-value updates from a plurality of sensor units but wait until all change-of-value messages are received prior to communicating back to the base unit, allowing the remote unit to maintain its low power functionality (i.e., "SLEEP state") and minimize the number of data transmissions between the remote and master units.

1360. Furthermore, it would be recognized by a POSITA that a remote unit that can receive and store change-of-value sensor data from a plurality of sensor devices can be further programmed to compile the updates into a single transmission, thus generating a change-of-value update in response to the change-of-value request message, wherein the change-of-value update includes a plurality of change-of-value messages (i.e., processed sensor data) received from a plurality of devices. Consequently, for at least the reasons above, it would be obvious to a POSITA that Helgeson discloses the limitations of claim element 1[e] of the '371 patent.

g. **1[f] communicate the change-of-value update via the wireless communication component at regular intervals according to a schedule or until a change-of-value acknowledgment is received.**

1361. The limitations of claim element 1[f] of the '371 patent are disclosed by Helgeson for at least the reasons described below.

1362. As discussed for claim element 1[e], the remote unit of Helgeson may be programmed by a POSITA to receive a plurality of change-of-value update messages (i.e., processed sensor data from a plurality of sensor devices) from the sensor inputs 66 in response to the change-of-value message request (i.e., "REQUEST FOR POLL") from the master unit as described for claim element 1[d] and compile the plurality of sensor messages into a single change-of-value message for communication back to the master unit. Helgeson additionally discloses methods in which this compiled change-of-value update can be communicated back to the base unit, namely at regular intervals according to a schedule. In more detail, Helgeson explicitly discloses "[i]n one

embodiment, remote units can be configured or programmed to transmit sensor data only on a timeout occurrence or on a change occurrence. For example, a temperature sensor may be configured to transmit every half-hour or upon a one (1) degree change from the last transmission." (Helgeson, [0032]). It would be clear to a POSITA, from the discussion for claim element 1[e], that such status information could comprise remote unit health or sensor information as requested by the master unit, including sensor value data or change-of-value updates from each sensor in communication with the controller 54 of the remote unit.

1363. Alternatively, another method for the communication of the change-of-value update message from the remote unit to the master unit disclosed by Helgeson is to wait until a change-of-value acknowledgment is received. More specifically, in reference to the algorithm of figure 4 of Helgeson, Helgeson discloses that "[u]pon completion of transmission, indicated at 111, a WAITING FOR ACKNOWLEDGE state 112 can be entered. While in this state, the transceiver can be switched to a receive mode at a receive frequency determined during GETTING SLOT state 106. While in this state, the remote is typically in a higher power consumption state relative to SLEEPING state 108. Upon reception of an ACKNOWLEDGEMENT from the master unit, indicated at 113, the remote unit can enter SLEEPING state 108 again" (Helgeson, [0035], emphasis added). Therefore, a POSITA would recognize that the remote unit would be able to communicate (i.e., repeatedly transmit) the change-of-value update until a change-of-value acknowledgment is received.

1364. Thus, for at least the reasons disclosed above, Helgeson discloses memory in communication with the processor, configured to communicate the change-of-value update via the wireless communication component at regular intervals according to a schedule or until a change-of-value acknowledgment is received, as required by the 1[f] claim by '371 patent.

ii.Claim 4

1365. Claim 4 of the ’371 Patent recites:

> The automation component of claim 1, wherein the change-of-value update is a change-of-value response message.

1366. Claim 4 of the ’371 depends upon claim 1 therein and includes additional limitations pertaining to the information contained within the change-of-value update. For at least the reasons detailed above in relation to claim 1, it is my opinion that Helgeson discloses each and every limitation of claim 1 of the ’371 patent; and, for at least the reasons below, it is my opinion that Helgeson also renders obvious the limitation added by claim 4.

1367. As discussed for claim 1, Helgeson discloses a wireless automation component (i.e., remote unit 24) within a building automation system. More specifically, as detailed for claim elements 1[a] through 1[d], the remote sensor unit 24 of Helgeson contains a memory in communication with a processor (i.e., controller 54) that is also in communication with at least one wireless communications component (i.e., transceiver 52) that provides a means by which to wirelessly communicate information to and from the master unit 22. Further, as detailed for claim elements 1[d] through 1[f], the remote unit 54 may be configured to: 1) receive a request message (i.e., POLL REQUEST) from the master unit for a change-of-value request; 2) receive sensor input information corresponding to changes-of-value from each of the sensor devices (i.e., sensor data); 3) generate a change-of-value update by compiling the change-of-value updates from each of the sensor devices in communication with the remote unit; and 4) communicate the change-of-value update back to the master unit. More specifically, as discussed for claim element 1[e], a POSITA would be motivated to program the remote unit 24 to communicate at regular intervals to save battery life. In other words, it would be straightforward to instruct the remote unit 24 to request change-of-value updates from a plurality of sensor devices, but wait until all change-of-value

messages are received prior to communicating back to the master unit 22, allowing the remote unit to maintain its low power functionality and minimize the number of data transmissions to the master unit.

1368. As such, it would be recognized to a POSITA that there are different kinds of information the change-of-value update could contain, including but not limited to (1) sensor measurement values (i.e., sensor data); (2) sensor status information (i.e., health data); (3) a message comprising sensor change-of-value information; and (4) combinations of the above. That is, one type of information within the change-of-value update may include at least one message containing change-of-updates messages from more than one sensor device external to the remote unit 24, in addition to other kinds of information obtained from the remote unit (e.g., diagnostics). Thus, for at least the reasons detailed above, Helgeson anticipates or renders obvious to a POSITA that the automation component identified in the alternate embodiment analysis for the preamble of claim 1 (i.e., remote unit 24) also satisfies the additional limitation of wherein the change-of-value update is a change-of-value response message of claim 4.

iii.Claim 5

1369. Claim 5 of the ’371 Patent recites:

> The automation component of claim 1, wherein the change-of-value update is automatically communicated.

1370. Claim 5 of the ’371 patent depends upon claim 1 therein, and includes additional limitations pertaining to the method in which the change-of-value update is communicated. For at least the reasons detailed above in relation to claim 1, it is my opinion that Helgeson discloses each and every limitation of claim 1 of the ’371 patent; and, for at least the reasons below, it is my opinion that Helgeson also renders obvious the limitation added by claim 5.

1371. As discussed for claim 1, Helgeson discloses a wireless automation component (i.e., remote unit 24) within a building automation system. More specifically, as detailed for claim elements 1[a] through 1[d], the remote sensor unit 24 of Helgeson contains a memory in communication with a processor (i.e., controller 54) that is also in communication with at least one wireless communications component (i.e., transceiver 52) that provides a means by which to wirelessly communicate information to and from the master unit 22. Further, as detailed for claim elements 1[d] through 1[f], the remote unit 54 may be configured to: 1) receive a request message (i.e., POLL REQUEST) from the master unit for a change-of-value request; 2) receive sensor input information corresponding to changes-of-value from each of the sensor devices (i.e., sensor data); 3) generate a change-of-value update by compiling the change-of-value updates from each of the sensor devices in communication with the remote unit; and 4) communicate the change-of-value update back to the master unit. More specifically, as discussed for claim element 1[f], a POSITA would be motivated to program the remote unit to communicate at regular intervals to save battery life. In other words, it would be clear to a POSITA that the remote unit would automatically and wirelessly communicate the change-of-value update to the master unit at regular intervals according to instructions programmed into the controller 54.

1372. Consequently, for at least the reasons above, Kates anticipates or renders obvious to a POSITA the remote unit 24 automation component of claim 1, wherein the change-of-value update is automatically communicated, as required by claim 5 by the ’371 patent.

E. Claims 1, 4, 5, 17, and 19 are anticipated or obvious to a POSITA in view of Hitt

i. Claim 1

Claim 1 of the ’371 Patent recites:

> An automation component configured for wireless communication within a building automation system, the automation component comprising:

a wireless communications component;

a processor in communication with the wireless communications component;

a memory in communication with the processor, the memory configured to store computer readable instructions which are executable by the processor; wherein the computer readable instructions are programmed to:

process a change-of-value request message received via the wireless communications component;

generate a change-of-value update in response to the change-of-value request message, wherein the change-of-value update includes a plurality of change-of-value messages received from a plurality of devices; and

communicate the change-of-value update via the wireless communication component at regular intervals according to a schedule or until a change-of-value acknowledgment is received.

1373. Claim 1 of the ’371 Patent claims an automation component for a wireless building automation control system comprising of a unit with processor, wireless communications, and memory that includes computer-readable instructions. This automation component is able to generate and process change-of-value requests and messages from a plurality of devices. In other words, the unit is checking measured values to see if they have changed with respect to some value. This unit is also able to create and send messages to other components of the system at regular intervals or until receiving an acknowledgement.

1374. As detailed in an element-by-element analysis below, every limitation of Claim 1 is disclosed, or at least rendered obvious to a POSITA in view of Hitt.

a. **1[pre] An automation component configured for wireless communication within a building automation system, the automation component comprising:**

1375. To the extent that the preamble is limiting, Hitt discloses an automation component configured for wireless communication within a building automation system, as discussed below.

1376. Specifically, Hitt discloses "[a] method for providing environmental monitoring and control" that "includes providing a network of wireless nodes," wherein "the wireless nodes include[] an array of sensor nodes and an array of actuator nodes, each wireless node including a wireless transceiver, a processor and one of a sensor device or an actuator device" (Hitt, Abstract). The disclosed method "includes sending a message from a first wireless node to a second wireless node through wireless communication; and processing the message at the second wireless node," where "the message may include sensor data or a control command operative to control the sensor device or the actuator device in the second wireless node" (Hitt, Abstract). Within the disclosed method, each wireless node (e.g., a sensor node or an actuator node) is an automation component configured for wireless communication. This is illustrated, for example, in Figures 2 and 2A of Hitt (reproduced below).

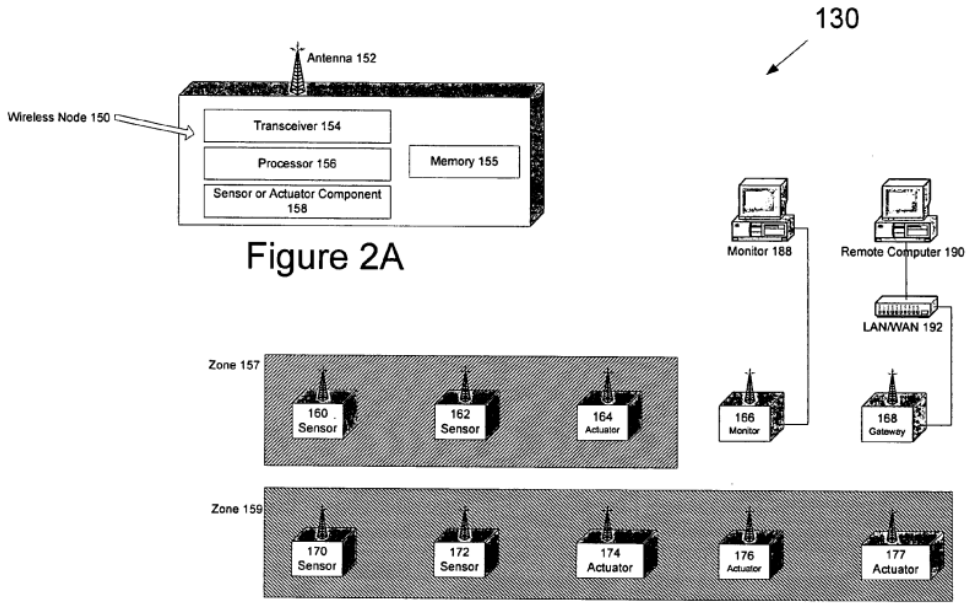


Figure 2A

Figure 2

Reproduction of Figures 2 and 2A from Hitt

1377. Hitt further discloses that its method is for "environmental monitoring and/or control" (Hitt, [0003]). Hitt does not specify the particular environment in which its disclosed method could be implemented, other than by indicating its use in environmental monitoring. However, and to the extent the preamble is limiting, a POSITA would have understood that the disclosed method could be used both, for example, in an outdoor application, as well as an indoor or building application (e.g., an indoor environmental monitoring application). In particular, in one embodiment, Hitt discloses an "environmental monitoring and control system" that is "configured for occupancy detection or intrusion detection" (Hitt, [0087]). In yet another embodiment, "the wireless environmental monitoring and control system can be applied to security applications" wherein "the sensor nodes are implemented using smoke detectors, infrared (IR) motion detection, ultrasonic presence detection, and security key detection" and "[t]he actuator nodes can be

implemented as alarms, such as a bell alarm or a visual alarm indicator" (Hitt, [0074]). A POSITA would understand these functions to be primarily associated with automation within a building.

1378. Further, other patents expressly identified in Hitt's disclosure describe applications in building automation systems, such as, for example, "U.S. Pat. No. 5,905,442" (Hitt, [0023]), which discloses a wireless automation system that "relates to a system for controlling electrical devices from remote locations over, for example, radio frequency links and which dispenses with any need to alter the internal wiring of the electrical system, i.e., the internal wiring of a building" ('442 patent, 1:7-17; *see* also Hitt, [0024]-[0026]).

1379. Thus, Hitt discloses an automation component (i.e., any wireless node) configured for wireless communications within a building automation system.

b. **1[a] a wireless communications component;**

1380. The limitations of claim element 1[a] of the '371 Patent are disclosed by Hitt for at least the reasons described below.

1381. For example, Hitt discloses one or more wireless nodes (e.g., sensor nodes or actuator nodes), where each wireless node has an antenna 152 and a transceiver 154 for wireless communications (Hitt, [0046]). This is illustrated, for example, in Figure 2A of Hitt (reproduced below).

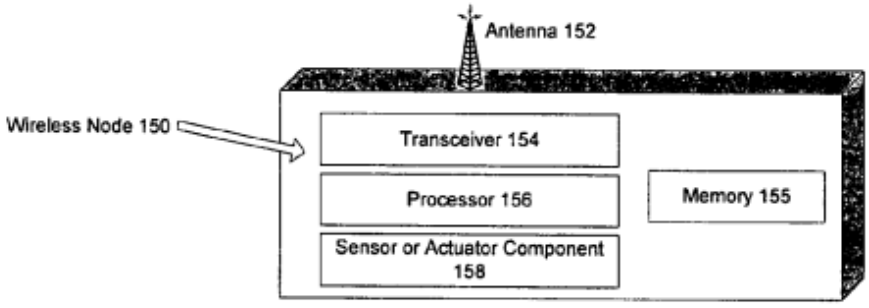


Figure 2A

Reproduction of Figure 2A from Hitt

1382. Hitt discloses that "each wireless node includ[es] a wireless transceiver" (Hitt, Abstract). Hitt further states that, "[i]n system 130, each sensor node and each actuator node incorporates a wireless communication transceiver to enable wireless communication between the nodes," where "[a]n insert FIG. 2A in FIG. 2 is a block diagram of a sensor/actuator node according to one embodiment of the present invention" (Hitt, [0046]). Hitt further states that "[i]n FIG. 2A, a wireless node 150 includes an antenna 152, a wireless transceiver 154, a processor 156 and a node component 158," where "[t]he wireless transceiver of each wireless node may communicate with a memory 155 that stores a unique transceiver identifier that identifies the wireless network" (Hitt, [0046]).

1383. Thus, for at least the reasons detailed above, Hitt discloses that the automation component identified in the analysis for the preamble of claim 1 (i.e., any wireless node) also satisfies the additional limitation of comprising a wireless communications component (i.e., wireless transceiver 154) of claim 1[a].

c. **1[b] a processor in communication with the wireless communications component;**

1384. The limitations of claim element 1[b] of the '371 Patent are disclosed by the Hitt patent for at least the reasons described below.

1385. As discussed for claim element 1[a], Hitt discloses a wireless automation device (i.e., any wireless node) comprising at least one wireless communications component (i.e., transceiver 154). Hitt further discloses that this automation component further comprises a processor in communication with the wireless communications component. More specifically, Hitt discloses one or more wireless nodes (e.g., sensor nodes or actuator nodes), where each wireless node has a processor 156. This is illustrated, for example, in Figure 2A of Hitt. Hitt states that "[i]n FIG. 2A,

a wireless node 150 includes an antenna 152, a wireless transceiver 154, a processor 156 and a node component 158," where "[t]he wireless transceiver of each wireless node may communicate with a memory 155 that stores a unique transceiver identifier that identifies the wireless network" (Hitt, [0046]). Hitt further states that "[p]rocessor 156 controls the operation of the wireless transceiver and the node component," and "[p]rocessor 156 usually includes a data interface configured to receive and/or transmit signals to node component 158" (Hitt, [0048]). Hitt further explains that "processor 156 can be operated to receive incoming control data from transceiver 154 and use the control data to control the actuator component," that "[p]rocessor 156 can also be operated to receive sensor data from a sensor component and direct the sensor data to be transmitted to an actuator node through the transceiver," and that "[p]rocessor 156 can also be provided with programming data to derive control data for an actuator node based on the sensor data received" (Hitt, [0048]; see also Hitt, Abstract, [0049]). Therefore, it would be clear to a POSITA that the processor 156 in a wireless node of Hitt would be in communication with a wireless communications component (i.e., wireless transceiver 154), and that Hitt consequently discloses the requirements of claim element 1[b] of the '371 patent.

d. **1[c] a memory in communication with the processor, the memory configured to store computer readable instructions which are executable by the processor; wherein the computer readable instructions are programmed to:**

1386. The limitations of claim element 1[c] of the '371 Patent are disclosed by Hitt for at least the reasons described below.

1387. As discussed for claim element 1[b], Hitt discloses a wireless automation component (i.e., any wireless node) comprising a processor in communication with a wireless communications component (i.e., wireless transceiver 154). More specifically, Hitt discloses one or more wireless nodes (e.g., sensor nodes or actuator nodes), where each wireless node has a memory 155. This is

illustrated, for example, in Figure 2A of Hitt. Hitt states that "[i]n FIG. 2A, a wireless node 150 includes an antenna 152, a wireless transceiver 154, a processor 156 and a node component 158," where "[t]he wireless transceiver of each wireless node may communicate with a memory 155 that stores a unique transceiver identifier that identifies the wireless network" (Hitt, [0046]). Hitt further states that "[t]he logic circuits for supporting the operation of each wireless node can be implemented in software or in firmware that is stored in a memory, such as memory 155," where "[t]he processor of the wireless node executes the instructions stored in the memory to carry out the message interpretation and transmission functions" (Hitt, [0065]). Hitt further explains that "processor 156 can be operated to receive incoming control data from transceiver 154 and use the control data to control the actuator component," that "[p]rocessor 156 can also be operated to receive sensor data from a sensor component and direct the sensor data to be transmitted to an actuator node through the transceiver," and that "[p]rocessor 156 can also be provided with programming data to derive control data for an actuator node based on the sensor data received." (Hitt, [0048]; see also Hitt, Abstract, [0049]). Thus, for at least the reasons disclosed above, Hitt discloses memory in communication with the processor, the memory configured to store computer readable instructions which are executable by the processor, as required by the 1[c] claim by '371 patent.

e. **1[d] process a change-of-value request message received via the wireless communications component;**

1388. The limitations of claim element 1[d] of the '371 Patent are disclosed by Hitt for at least the reasons described below.

1389. As discussed for claim element 1[c], Hitt discloses that any wireless node automation component comprises a memory in communication with a processor. Additionally, Hitt discloses that the memory can store computer readable instructions (i.e., programming data) that may be

programmed to process a change-of-value request message received via the wireless communications component.

1390. Hitt discloses that each wireless node can be a sensor node, that may be "implemented as a sensor component, such as a soil moisture sensor or an temperature sensor" (Hitt, [0046]). Hitt further states that "[i]n one embodiment, the sensor component can be any one of or a combination of: an air temperature sensor, a relative humidity sensor, a light level sensor, a soil moisture sensor, a soil temperature sensor, a soil dissolved oxygen sensor, a soil pH sensor, a soil conductivity sensor, a soil dielectric frequency response sensor" (Hitt, [0050]). Hitt explains that each wireless node, such as a sensor node, may receive a request message from another wireless node that is requesting information. For example, Hitt discloses that "[i]n one embodiment, the sensor nodes collect sensor data and determine actuator function as needed," where, "[w]hen actuator function is needed, messages can be sent across the wireless network from a sensor node to the respective actuator node" (Hitt, [0055]). Hitt further explains that, "[i]n another embodiment, any wireless node in the network can integrate data from one or more sensor nodes to determine the appropriate actuator function," where "[s]uch a wireless node is sometimes referred to as 'an intermediate node' where sensor data are sent for processing and resulting actuator commands are forwarded to the respective actuator nodes," and "[t]he intermediate node functions as a data processing station supporting respective sensor nodes and respective actuator nodes" (Hitt, [0055]).

1391. Hitt further explains that "[i]n another embodiment, every wireless node in the network can receive data or commands from other wireless nodes, including user input nodes, actuator nodes, sensor nodes and other monitor nodes (like gateway nodes)" (Hitt, [0056]). Hitt states that "[e]ach wireless node integrates those data and/or commands to determine the correct operations," where "[i]n one embodiment, sensor data from the sensor nodes are broadcast to all nodes in the

network," and "[a]ctuator nodes receiving the sensor data can selectively process the sensor data relevant to their function" (Hitt, [0056]). Hitt states that "[t]he plurality of remote devices typically uses remote sensors to monitor and actuators to respond to various system parameters to reach desired results" (Hitt, [0019]).

1392. With respect to data, Hitt states that "[i]n system 130, any of the wireless node, whether it is a sensor node or an actuator node, can transmit messages to any other node" and "thus, a sensor node can process sensor data it is sensing and can issue commands to an actuator node for controlling the irrigation of a zone" (Hitt, [0057]). Hitt also states that "[a]lternately, a sensor node can collect sensor data from itself and sensor data from other sensor nodes in the respective area and process the sensor data collectively" and "[t]he sensor node can then provide commands accordingly to control the operation of the associated actuator node 164" (Hitt, [0057]).

1393. With respect to a request, Hitt discloses that "[i]n one embodiment, an actuator node sends a message to an associated sensor node requesting sensor data and/or commands," where "[t]he sensor node in response processes the sensor data from itself or from associated sensor nodes and provide the sensor data and/or actuator commands to the requesting actuator node" (Hitt, [0058], [0060]). Hitt further discloses that such data may include, for example, "a sensor node can periodically sample the sensor and the sensor data is aggregated into a local memory for processing and/or transmission" (Hitt, [0068], Fig. 5). Hitt explains that "the sensor node is programmed to periodically acquire sensor data (step 502)," where "the sensor data is filtered (step 504) and/or compressed and/or processed (step 506)" (Hitt, [0068]).

1394. Hitt explains that "[p]rocessing can include statistical analysis (average, median, standard deviation and higher order correlations), linear regression, linear approximation and other mathematical modeling processes to improve the usability of the data," where "[t]he processed

sensor data is stored in a local memory (step 508)" (Hitt, [0068]). Hitt explains that "[t]he processed sensor data can then be delivered to other wireless nodes in the system as created on a periodic schedule or as requested by other nodes in the system," where "[i]f data is delivered as requested, or on command from another node in the network, the request or command contains the address of the requester to where the data is to be sent" (Hitt, [0069]; see also Hitt, [0067]).

1395. Hitt further discloses that "the wireless environmental monitoring and control system can be applied to security applications," where "the sensor nodes are implemented using smoke detectors, infrared (IR) motion detection, ultrasonic presence detection, and security key detection," and "[d]etection of the presence of smoke or motion can be transmitted as messages to the actuator nodes so that the events can be reported accordingly" (Hitt, [0074]).

1396. For a POSITA, this disclosure describes a change-of-value request message received via the wireless communications, particularly in light of the Court's construction that "transmission of the detected values, received values, parameters, or measurements themselves can serve as that indication of change." The sensor readings relevant to the actuator node may change over the operation of the device, requiring the actuator to send a change-of-value request seeking updated data and/or control signals based on updated data in order to determine if further actions are required (e.g., by the actuator) based on an indicated change. Hitt further discloses that the sensor nodes may process sensor data and receive processed sensor data from other nodes, which may provide an indication of change from which the actuator can take further action if needed.

1397. Thus, for at least the reasons disclosed above, Hitt discloses memory in communication with the processor, configured to process a change-of-value request message received via the wireless communications component, as required by the 1[d] claim by '371 patent.

f. **1[e] generate a change-of-value update in response to the change-of-value request message, wherein the change-of-value update includes a plurality of change-of-value messages received from a plurality of devices; and**

1398. The limitations of claim element 1[e] of the ’371 Patent are disclosed by Hitt for at least the reasons described below.

1399. For example, Hitt explains that each wireless node, such as a sensor node, may receive a request message from another wireless node that requested information. For example, Hitt discloses that “[i]n one embodiment, the sensor nodes collect sensor data and determine actuator function as needed,” where, “[w]hen actuator function is needed, messages can be sent across the wireless network from a sensor node to the respective actuator node” (Hitt, [0055]).

1400. Hitt further explains that, “[i]n another embodiment, any wireless node in the network can integrate data from one or more sensor nodes to determine the appropriate actuator function,” where “[s]uch a wireless node is sometimes referred to as ‘an intermediate node’ where sensor data are sent for processing and resulting actuator commands are forwarded to the respective actuator nodes,” and “[t]he intermediate node functions as a data processing station supporting respective sensor nodes and respective actuator nodes” (Hitt, [0055]).

1401. Hitt further explains that “[i]n another embodiment, every wireless node in the network can receive data or commands from other wireless nodes, including user input nodes, actuator nodes, sensor nodes and other monitor nodes (like gateway nodes)” (Hitt, [0056]). Hitt states that “[e]ach wireless node integrates those data and/or commands to determine the correct operations,” where “[i]n one embodiment, sensor data from the sensor nodes are broadcast to all nodes in the network,” and “[a]ctuator nodes receiving the sensor data can selectively process the sensor data relevant to their function” (Hitt, [0056]).

1402. With respect to data, Hitt states that: "[i]n system 130, any of the wireless node, whether it is a sensor node or an actuator node, can transmit messages to any other node. Thus, a sensor node can process sensor data it is sensing and can issue commands to an actuator node for controlling the irrigation of a zone. Alternately, a sensor node can collect sensor data from itself and sensor data from other sensor nodes in the respective area and process the sensor data collectively. The sensor node can then provide commands accordingly to control the operation of the associated actuator node 164" (Hitt, [0057]).

1403. With respect to a request, Hitt discloses that "[i]n one embodiment, an actuator node sends a message to an associated sensor node requesting sensor data and/or commands," where "[t]he sensor node in response processes the sensor data from itself or from associated sensor nodes and provide[s] the sensor data and/or actuator commands to the requesting actuator node" (Hitt, [0058], [0060]). Hitt further discloses that such data may include, for example, "a sensor node can periodically sample the sensor and the sensor data is aggregated into a local memory for processing and/or transmission" (Hitt, [0068], Fig. 5).

1404. Hitt explains that "the sensor node is programmed to periodically acquire sensor data (step 502)," where "the sensor data is filtered (step 504) and/or compressed and/or processed (step 506)" (Hitt, [0068]). Hitt explains that "[p]rocessing can include statistical analysis (average, median, standard deviation and higher order correlations), linear regression, linear approximation and other mathematical modeling processes to improve the usability of the data," where "[t]he processed sensor data is stored in a local memory (step 508)" (Hitt, [0068]). Hitt explains that "[t]he processed sensor data can then be delivered to other wireless nodes in the system as created on a periodic schedule or as requested by other nodes in the system," where "[i]f data is delivered

as requested, or on command from another node in the network, the request or command contains the address of the requester to where the data is to be sent" (Hitt, [0069]; see also Hitt, [0067]).

1405. For a POSITA, this description would disclose the generation of a change-of-value update in response to the above mentioned change-of-value request of claim element 1[d], particularly in light of the Court's construction that "transmission of the detected values, received values, parameters, or measurements themselves can serve as that indication of change." For example, in response to a request for updated data or command instructions by another node (e.g., an actuator node), a node acting as an "intermediate node" may transmit integrated sensor data received from a plurality of sensor nodes (which may include aggregated and/or processed sensor data from each such sensor node indicating changes in value as such nodes).

1406. Thus, for at least the reasons disclosed above, Hitt discloses memory in communication with the processor, configured to generate a change-of-value update in response to the change-of-value request message described in 1[d], wherein the change-of-value update includes a plurality of change-of-value messages received from a plurality of devices, as required by the 1[e] claim by the '371 patent.

g. **1[f] communicate the change-of-value update via the wireless communication component at regular intervals according to a schedule or until a change-of-value acknowledgment is received.**

1407. The limitations of claim element 1[f] of the '371 Patent are disclosed by Hitt for at least the reasons described below.

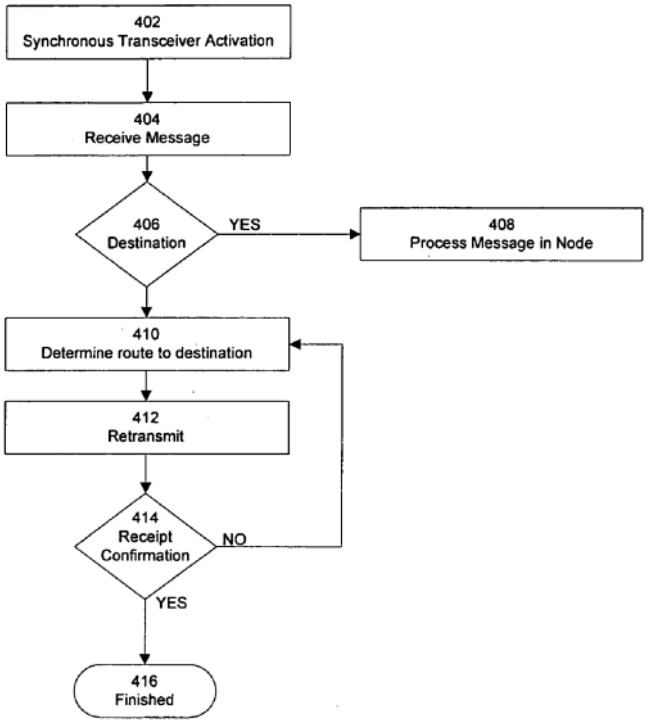
1408. Hitt emphasizes the importance of power conservation in its disclosed system and method. For example, Hitt explains that "the wireless nodes, whether a sensor node or an actuator node, are typically battery powered or solar powered and thus power conservation is critical" (Hitt, [0075]). Therefore, "[i]n accordance with one aspect of the present invention, a scheduled

transmission protocol is implemented in the environmental monitoring and control system for promoting efficient power use and power conservation" (Hitt, [0075], emphasis added). This scheduled transmission protocol includes the communication of the above-mentioned change-of-value update via the wireless communications component at regular intervals according to a schedule, or until an acknowledgement is received.

1409. For example, Hitt discloses that that either the receiving node or the sending node can schedule transmission timeslots or negotiate timeslots for transmission (Hitt, [0076]-[0078]). Hitt discloses that, for example, where a receiving node schedules a transmission slot, "[t]he sensor nodes send message packets at scheduled times and the receiver node responds to transmissions with an acknowledge packet," where "[t]he acknowledge packet contains the timing information for the sensor node[']s next scheduled packet transmission and the next frequency of transmission (if frequency hopping is used)" (Hitt, [0076]). Hitt explains that "[t]he benefit of this protocol is that the sensor nodes and receiver nodes can sleep until the next scheduled transmission slot, saving a tremendous amount of power" (Hitt, [0076]). Likewise, the sending nodes can also provide the transmission schedule (Hitt, [0077]).

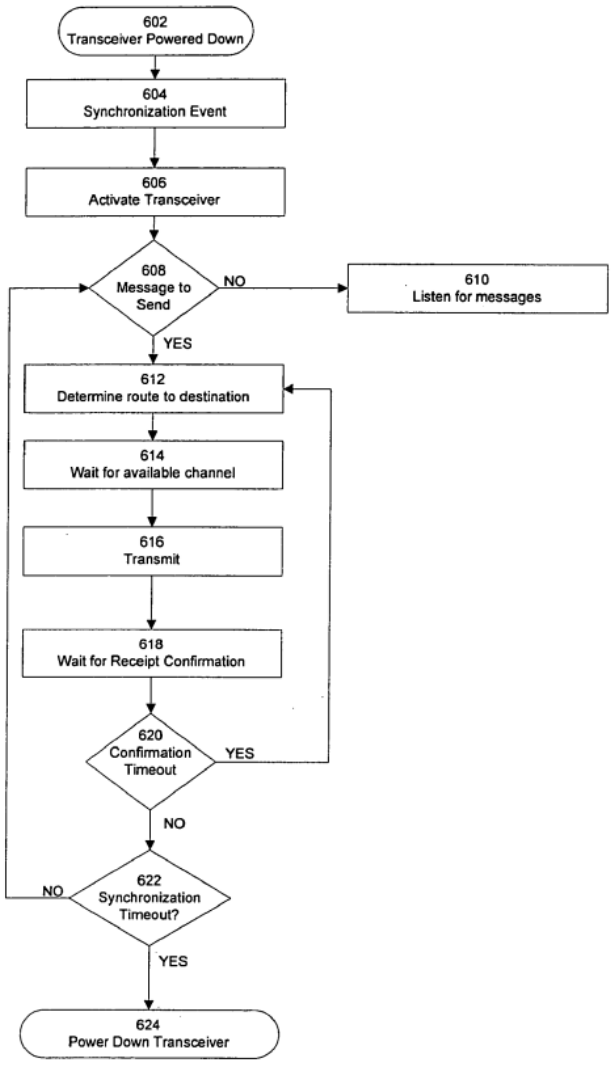
1410. Hitt further discloses exemplary flowcharts for transmission schedules where an update is communicated on a periodic schedule or until an acknowledgment packet is received. These are disclosed, for example, in Figures 4 and 6 of Hitt (reproduced below).

Figure 4 - Transceiver Routing



Reproduction of Figure 4 from Hitt

Figure 6 - Transceiver Synchronization



Reproduction of Figure 6 from Hitt

1411. With respect to the flowchart in Figure 4, Hitt explains that "FIG. 4 is a flow chart illustrating the operation of each wireless node for receiving and transmitting messages within the environmental monitoring and control system according to one embodiment of the present invention" and that "[i]n the present embodiment, the transceivers in the wireless nodes of the system are synchronously activated to establish end-to-end network connectivity (step 402)." Further, "[t]he wireless transceiver receives an incoming message via the antenna (step 404). The transceiver receives the incoming message, modifies the received signal, and passes the modified

signal onto the processor. The processor evaluates the message to determine the intended recipient (step 406). If the intended recipient is the wireless node itself, the processor then prepares the appropriate response (step 408). The response may include collecting data from the sensor or providing a control signal to the actuator. If the intended recipient is not the wireless node itself, the processor then prepares the message to be re-transmitted to the intended recipient. Specifically, the processor of the wireless node determines the best route to the destination (step 410) and retransmits the message as necessary (step 412). The best route can be determined by the smallest number of intermediate nodes, by nodes with the maximum power available and by most reliable links. The wireless node awaits confirmation of receipt of the message (step 414). When the confirmation is not received, the wireless node attempts to retransmit the message by returning to step 410. When confirmation is received, the processing for the message is completed" (Hitt, [0064]).

1412. With respect to the flowchart in Figure 6, the disclosed operations focus on energy conservation by implementing "powered down" states. Hitt explains that "FIG. 6 is a flow chart illustrating the transceiver synchronization operation according to one embodiment of the present invention. Referring to FIG. 6, in normal operation, the environmental monitoring and control system causes the transceivers of all the wireless nodes to power down (step 602). Then, when messages are to be transmitted, a synchronization event is used to synchronously bring all nodes out of a powered down state (step 604)…After the transceiver is activated (step 606), the transceiver in a wireless node determine if it has a message to send (step 608). If not, then the transceiver listens for incoming messages (step 610). If there is a message to be sent, the transceiver determines the route to the destination (step 612). The transceiver then waits for available channel (step 614) and when a channel is available, the message is transmitted (step 616).

The transceiver waits for receipt confirmation (step 618) from the destination node (step 618). If confirmation is not received within the timeout period (step 620), then the transceiver returns to step 612 and attempt transmission again. If confirmation is received, then the transceiver checks to see if the synchronization has timed out (step 622). If so, the transceiver is powered down (step 624). If synchronization has not yet timed out, then the operation returns to step 608 where the transceiver determines if there is a message to be sent" (Hitt, [0072]-[0073]).

1413. As discussed above, the transmitted information may be a change-of-value update transmitted in response to a request from another wireless node. Hitt discloses, in two different embodiments, a transmission scheme to ensure reception of the update by the receiving device, where the transmission occurs at a regular interval according to a schedule or until an acknowledgement (confirmation) is received.

1414. Thus, for at least the reasons disclosed above, Hitt discloses memory in communication with the processor, configured to communicate the change-of-value update via the wireless communication component at regular intervals according to a schedule or until a change-of-value acknowledgment is received, as required by the 1[f] claim by '371 patent.

ii.Claim 4

1415. Claim 4 of the '371 Patent recites:

> The automation component of claim 1, wherein the change-of-value update is a change-of-value response message.

1416. The limitations of claim element 4 of the '371 Patent are disclosed by Hitt for at least the reasons described below.

1417. As discussed in claim 1[a] through 1[c], there is a wireless node containing a processor and readable memory which contains computer-readable instructions. A POSITA would understand this to be an automated component capable of sending messages. In addition, for the reasons

discussed above with respect to claim 1 (including claim elements 1[e] and 1[f]), a POSITA would understand Hitt to disclose generating and communicating of a change-of-value update that includes a plurality of change-of-value messages received from a plurality of devices. Further, for the reasons discussed above with respect to claim 1 (including claim elements 1[e] and 1[f]), a POSITA would understand Hitt to disclose generating and communicating of a change-of-value update in response to a change-of-value request received by the transmitting wireless node from another wireless node (e.g., an actuator node) within the disclosed automation system.

1418. Thus, for at least the reasons disclosed above, Hitt discloses an automation component of claim 1, wherein the change-of-value update is a change-of-value response message, as required by the 4 claim by ’371 patent.

iii.Claim 5

1419. Claim 5 of the ’371 Patent recites:

> The automation component of claim 1, wherein the change-of-value update is automatically communicated.

1420. The limitations of claim element 5 of the ‘371 Patent are disclosed by Hitt for at least the reasons described below.

1421. As discussed in claim 1[a] through 1[c], there is a wireless node containing a processor and readable memory which contains computer-readable instructions. A POSITA would understand this to be an automated component capable of sending messages. In addition, for the reasons discussed above with respect to claim 1 (including claim elements 1[e] and 1[f]), a POSITA would understand Hitt to disclose generating and communicating of a change-of-value update that includes a plurality of change-of-value messages received from a plurality of devices. Further, for the reasons discussed above with respect to claim 1 (including claim elements 1[e] and 1[f]), a POSITA would understand Hitt to disclose generating and communicating of a change-of-value

update in response to a change-of-value request received by the transmitting wireless node from another wireless node (e.g., an actuator node) within the disclosed automation system. Hitt discloses that these operations occur automatically within the disclosed system and method, inasmuch as the programming of the disclosed processors causes the wireless nodes to implement the disclosed functions (e.g., receiving requests, processing data, transmitting data and/or commands) without requiring non-automated intervention. Hitt further discloses embodiments implementing its disclosure as "automatic" systems. (*See* Hitt, [0040]). Thus, for at least the reasons disclosed above, Hitt discloses the automation component of claim 1, wherein the change-of-value update is automatically communicated, as required by claim 4 of the '371 patent.

iv.Claim 17

1422. Claim 17 of the '371 Patent recites:

> A method of communicating information between automation components operating within a building automation system, the method comprising:
>
> receiving a plurality of change-of-value messages from a plurality of wireless devices, each of the plurality of change-of-value messages representing a wireless device indication;
>
> storing the received change-of-value messages according to the corresponding wireless device of the plurality of wireless devices; and
>
> communicating a change-of-value update that includes the plurality of change-of-value messages, and repeating the change-of-value update at regular intervals according to a schedule or until a change-of-value acknowledgment is received.

1423. Claim 17 of the '371 Patent claims a method of communicating information between automation components in a wireless building automation control system. These components are claimed to communicate with a plurality of devices, each with a change-of-value message, store that change-of-value message with a device identifier, and communicate the plurality of change-

of-value messages with other automation components, at a schedule or until a change-of-value acknowledgement is received.

1424. As detailed in an element-by-element analysis below, every limitation of Claim 17 is disclosed, or at least rendered obvious to a POSITA in view of Hitt.

a. **17[pre] A method of communicating information between automation components operating within a building automation system, the method comprising:**

1425. To the extent that the preamble is limiting, Hitt discloses automation components configured for wireless communication within a building automation system, as discussed below.

1426. Specifically, Hitt discloses "[a] method for providing environmental monitoring and control includes providing a network of wireless nodes, the wireless nodes include[] an array of sensor nodes and an array of actuator nodes, each wireless node including a wireless transceiver, a processor and one of a sensor device or an actuator device" (Hitt, Abstract). The disclosed method "includes sending a message from a first wireless node to a second wireless node through wireless communication; and processing the message at the second wireless node," where "the message may include sensor data or a control command operative to control the sensor device or the actuator device in the second wireless node" (Hitt, Abstract). Within the disclosed method, each wireless node (e.g., a sensor node or an actuator node) is an automation component configured for wireless communication. This is illustrated, for example, in Figures 2 and 2A of Hitt (reproduced below).

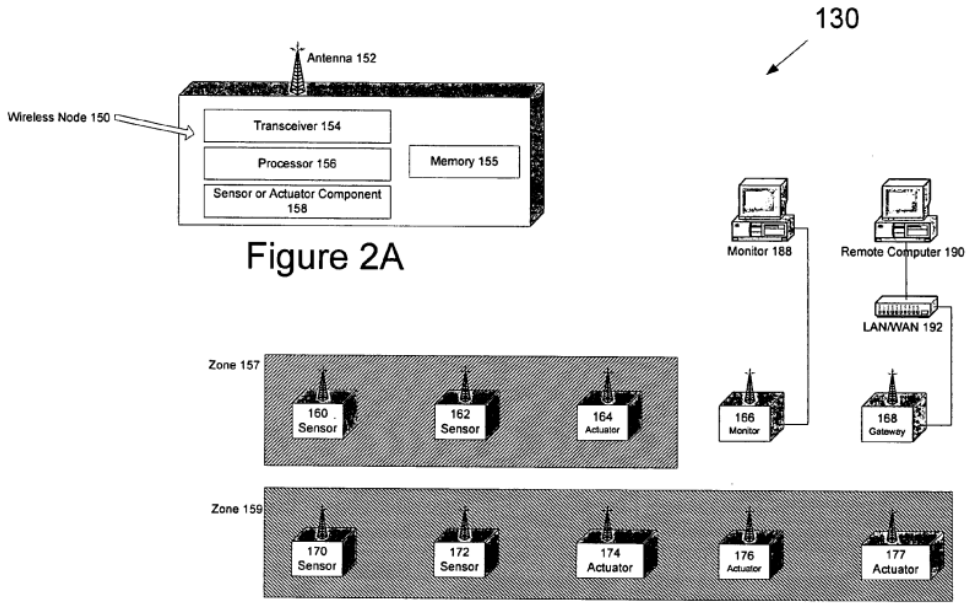


Figure 2A

Figure 2

Reproduction of Figures 2 and 2A from Hitt

1427. Hitt further discloses that its method is for "environmental monitoring and/or control" (Hitt, [0003]). Hitt does not specify the particular environment in which its disclosed method could be implemented, other than by indicating its use in environmental monitoring. However, and to the extent the preamble is limiting, a POSITA would have understood that the disclosed method could be used both, for example, in an outdoor application, as well as an indoor or building application (e.g., an indoor environmental monitoring application). In particular, in one embodiment, Hitt discloses an "environmental monitoring and control system" that is "configured for occupancy detection or intrusion detection" (Hitt, [0087]). In yet another embodiment, "the wireless environmental monitoring and control system can be applied to security applications" wherein "the sensor nodes are implemented using smoke detectors, infrared (IR) motion detection, ultrasonic presence detection, and security key detection" and "[t]he actuator nodes can be

implemented as alarms, such as a bell alarm or a visual alarm indicator" (Hitt, [0074]). A POSITA would understand these functions to be primarily associated with automation within a building.

1428. Further, other patents expressly identified in Hitt's disclosure describe applications in building automation systems, such as, for example, U.S. Pat. No. 5,905,442 (Hitt, [0023]), which discloses a wireless automation system that "relates to a system for controlling electrical devices from remote locations over, for example, radio frequency links and which dispenses with any need to alter the internal wiring of the electrical system, i.e., the internal wiring of a building" ('442 patent, 1:7-17; *see* also Hitt, [0024]-[0026]).

1429. Thus, Hitt discloses a method of communicating information between automation components operating within a building automation system.

b. **17[a] receiving a plurality of change-of-value messages from a plurality of wireless devices, each of the plurality of change-of-value messages representing a wireless device indication;**

1430. The limitations of claim element 17[a] of the '371 Patent are disclosed by Hitt for at least the reasons described below.

1431. For example, Hitt explains that each wireless node, such as a sensor node, may receive a request message from another wireless node that requesting information. For example, Hitt discloses that "[i]n one embodiment, the sensor nodes collect sensor data and determine actuator function as needed," where, "[w]hen actuator function is needed, messages can be sent across the wireless network from a sensor node to the respective actuator node" (Hitt, [0055]).

1432. Hitt further explains that, "[i]n another embodiment, any wireless node in the network can integrate data from one or more sensor nodes to determine the appropriate actuator function," where "[s]uch a wireless node is sometimes referred to as 'an intermediate node' where sensor data are sent for processing and resulting actuator commands are forwarded to the respective

actuator nodes," and "[t]he intermediate node functions as a data processing station supporting respective sensor nodes and respective actuator nodes" (Hitt, [0055]).

1433. Hitt further explains that "[i]n another embodiment, every wireless node in the network can receive data or commands from other wireless nodes, including user input nodes, actuator nodes, sensor nodes and other monitor nodes (like gateway nodes)" (Hitt, [0056]). Hitt states that "[e]ach wireless node integrates those data and/or commands to determine the correct operations," where "[i]n one embodiment, sensor data from the sensor nodes are broadcast to all nodes in the network," and "[a]ctuator nodes receiving the sensor data can selectively process the sensor data relevant to their function" (Hitt, [0056]).

1434. With respect to data, Hitt states that "[i]n system 130, any of the wireless node, whether it is a sensor node or an actuator node, can transmit messages to any other node. Thus, a sensor node can process sensor data it is sensing and can issue commands to an actuator node for controlling the irrigation of a zone. Alternately, a sensor node can collect sensor data from itself and sensor data from other sensor nodes in the respective area and process the sensor data collectively. The sensor node can then provide commands accordingly to control the operation of the associated actuator node 164" (Hitt, [0057]).

1435. With respect to a request, Hitt discloses that "[i]n one embodiment, an actuator node sends a message to an associated sensor node requesting sensor data and/or commands," where "[t]he sensor node in response processes the sensor data from itself or from associated sensor nodes and provide the sensor data and/or actuator commands to the requesting actuator node" (Hitt, [0058], [0060]). Hitt further discloses that such data may include, for example, "a sensor node can periodically sample the sensor and the sensor data is aggregated into a local memory for processing and/or transmission" (Hitt, [0068], Fig. 5).

1436. Hitt explains that "the sensor node is programmed to periodically acquire sensor data (step 502)," where "the sensor data is filtered (step 504) and/or compressed and/or processed (step 506)" (Hitt, [0068]). Hitt explains that "[p]rocessing can include statistical analysis (average, median, standard deviation and higher order correlations), linear regression, linear approximation and other mathematical modeling processes to improve the usability of the data," where "[t]he processed sensor data is stored in a local memory (step 508)" (Hitt, [0068]). Hitt explains that "[t]he processed sensor data can then be delivered to other wireless nodes in the system as created on a periodic schedule or as requested by other nodes in the system," where "[i]f data is delivered as requested, or on command from another node in the network, the request or command contains the address of the requester to where the data is to be sent" (Hitt, [0069]; see also Hitt, [0067]).

1437. Hitt further discloses that the wireless nodes may also communicate device identifier or indicator information associated with received or transmitted data. For example, with respect to Fig. 2A, Hitt states that "wireless node 150 includes an antenna 152, a wireless transceiver 154, a processor 156 and a node component 158," where "[t]he wireless transceiver of each wireless node may communicate with a memory 155 that stores a unique transceiver identifier that identifies the wireless network" [0046]). Hitt further states that "the transceiver in a wireless node may receive a command message on the antenna via a message protocol," where "[t]he command message may be initiated from another wireless node, or any other device connected to the system through a gateway." (Hitt, [0066]). Hitt further states that "[t]he processor may evaluate the received message to determine if the recipient's address is its own unique address," where, "[i]f it is, then the processor evaluates the command and prepares a response message" (Hitt, [0066]). Thus, a POSITA would understand Hitt to disclose transmission of unique addresses corresponding to nodes with information from the node received.

1438. Hitt further states that, "[i]n response to the command message, the processor receives the data related to the sensor or the actuator," where "the data may be stored in the memory and the processor retrieves the data from the memory 208" and "[t]he processor may also retrieve the unique address locations of the data from the memory" (Hitt, [0067]). Hitt further discloses that the processor may thereafter "format[] a transmit signal in response to the command message as described above," and "[t]he processor then communicates the transmit signal to the transceiver, which provides the transmit signal to the wireless control system" (Hitt, [0067]).

1439. Hitt further discloses that the actuator node receiving sensor data or commands from various nodes may identify which node the data is received from based on transmitted information, and act accordingly. For example, Hitt discloses that "[i]n one embodiment, sensor data from the sensor nodes are broadcast to all nodes in the network," where "[a]ctuator nodes receiving the sensor data can selectively process the sensor data relevant to their function. For example, an actuator node in irrigation zone 1 receives data and processes the data from all sensor nodes related to the zone1 only" (Hitt, [0056]).

1440. Therefore, for at least the reasons disclosed above, Hitt discloses the automation component receiving a plurality of change-of-value messages from a plurality of wireless devices, each of the plurality of change-of-value messages representing a wireless device indication as required by the 17[a] claim by the '371 patent.

c. **17[b] storing the received change-of-value messages according to the corresponding wireless device of the plurality of wireless devices; and**

1441. The limitations of claim element 17[b] of the '371 Patent are disclosed by the Kates patent for at least the reasons described below.

1442. For example, Hitt discloses one or more wireless nodes (e.g., sensor nodes or actuator nodes), where each wireless node has a memory 155. This is illustrated, for example, in Figure 2A

of Hitt. Hitt states that "[i]n FIG. 2A, a wireless node 150 includes an antenna 152, a wireless transceiver 154, a processor 156 and a node component 158," where "[t]he wireless transceiver of each wireless node may communicate with a memory 155 that stores a unique transceiver identifier that identifies the wireless network" (Hitt, [0046]).

1443. Hitt further states that "[t]he logic circuits for supporting the operation of each wireless node can be implemented in software or in firmware that is stored in a memory, such as memory 155," where "[t]he processor of the wireless node executes the instructions stored in the memory to carry out the message interpretation and transmission functions" (Hitt, [0065]). Hitt further explains that "processor 156 can be operated to receive incoming control data from transceiver 154 and use the control data to control the actuator component," that "[p]rocessor 156 can also be operated to receive sensor data from a sensor component and direct the sensor data to be transmitted to an actuator node through the transceiver," and that "[p]rocessor 156 can also be provided with programming data to derive control data for an actuator node based on the sensor data received" (Hitt, [0048]; see also Hitt, Abstract, [0049]).

1444. Hitt further discloses the storage of data (including data received from other nodes) corresponding to the node the data was received from. For example, Hitt discloses that "[i]n response to the command message, the processor receives the data related to the sensor or the actuator," where "the data may be retrieved by initiating a request to the sensor or actuator" (Hitt, [0067]). Hitt further discloses that "[i]n another embodiment, the data may be stored in the memory and the processor retrieves the data from the memory 208," where "[t]he processor may also retrieve the unique address locations of the data from the memory" (Hitt, [0067]). The processor then "formats a transmit signal in response to the command message as described above," and "[t]he processor then communicates the transmit signal to the transceiver, which provides the

transmit signal to the wireless control system" (Hitt, [0067]), and "[t]he transmit signal is then delivered to the intended point, such as a monitoring node" (Hitt, [0067]).

1445. Hitt further discloses that "a sensor node can periodically sample the sensor and the sensor data is aggregated into a local memory for processing and/or transmission" (Hitt, [0068]). Hitt also discloses that sensor data may be processed, and "[t]he processed sensor data is stored in a local memory" (Hitt, [0068]). Furthermore, "any wireless node in the network can integrate data from one or more sensor nodes to determine the appropriate actuator function" (Hitt, [0055]). Likewise, "every wireless node in the network can receive data or commands from other wireless nodes, including user input nodes, actuator nodes, sensor nodes and other monitor nodes (like gateway nodes)," where "[e]ach wireless node integrates those data and/or commands to determine the correct operations" (Hitt, [0056]).

1446. As described above, Hitt discloses that unique identifier information may be transmitted with data and/or commands, such that, for example, and actuator can identify the source of the data and/or commands and act accordingly (see claim element 17[a]). A POSITA would understand that the unique identified information would be included in integrated data received and stored at, for example, a sensor node operating as an "intermediate node," so that the data could be processed and used as necessary by other receiving nodes.

1447. Therefore, for at least the reasons listed above, Hitt discloses an automation component storing the received change-of-value messages according to the corresponding wireless device of the plurality of wireless devices, as required by claim element 17[b].

d. **17[c] communicating a change-of-value update that includes the plurality of change-of-value messages, and repeating the change-of-value update at regular intervals according to a schedule or until a change-of-value acknowledgment is received.**

1448. The limitations of claim element 17[c] of the '371 Patent are disclosed by Hitt for at least the reasons described below.

1449. For example, Hitt explains that, "[i]n another embodiment, any wireless node in the network can integrate data from one or more sensor nodes to determine the appropriate actuator function," where "[s]uch a wireless node is sometimes referred to as 'an intermediate node' where sensor data are sent for processing and resulting actuator commands are forwarded to the respective actuator nodes," and "[t]he intermediate node functions as a data processing station supporting respective sensor nodes and respective actuator nodes" (Hitt, [0055]).

1450. Hitt further explains that "[i]n another embodiment, every wireless node in the network can receive data or commands from other wireless nodes, including user input nodes, actuator nodes, sensor nodes and other monitor nodes (like gateway nodes)" (Hitt, [0056]). Hitt states that "[e]ach wireless node integrates those data and/or commands to determine the correct operations," where "[i]n one embodiment, sensor data from the sensor nodes are broadcast to all nodes in the network," and "[a]ctuator nodes receiving the sensor data can selectively process the sensor data relevant to their function." (Hitt, [0056]).

1451. With respect to data, Hitt states that "[i]n system 130, any of the wireless node, whether it is a sensor node or an actuator node, can transmit messages to any other node. Thus, a sensor node can process sensor data it is sensing and can issue commands to an actuator node for controlling the irrigation of a zone. Alternately, a sensor node can collect sensor data from itself and sensor data from other sensor nodes in the respective area and process the sensor data collectively. The

sensor node can then provide commands accordingly to control the operation of the associated actuator node 164" (Hitt, [0057]).

1452. Hitt explains that "the sensor node is programmed to periodically acquire sensor data (step 502)," where "the sensor data is filtered (step 504) and/or compressed and/or processed (step 506)" (Hitt, [0068]). Hitt explains that "[p]rocessing can include statistical analysis (average, median, standard deviation and higher order correlations), linear regression, linear approximation and other mathematical modeling processes to improve the usability of the data," where "[t]he processed sensor data is stored in a local memory (step 508)" (Hitt, [0068]). Hitt explains that "[t]he processed sensor data can then be delivered to other wireless nodes in the system as created on a periodic schedule or as requested by other nodes in the system," where "[i]f data is delivered as requested, or on command from another node in the network, the request or command contains the address of the requester to where the data is to be sent" (Hitt, [0069]; see also Hitt, [0067]).

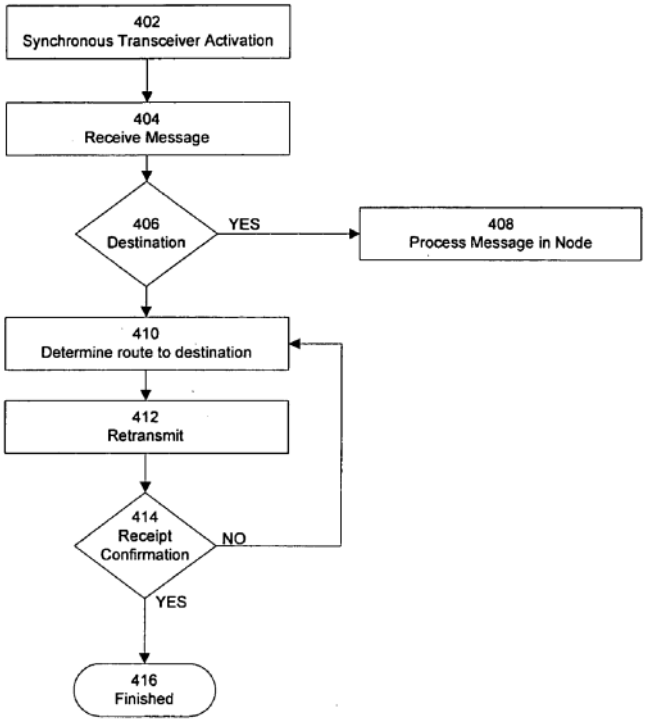
1453. Hitt also emphasizes the importance of power conservation in its disclosed system and method. For example, Hitt explains that "the wireless nodes, whether a sensor node or an actuator node, are typically battery powered or solar powered and thus power conservation is critical." (Hitt, [0075]). Therefore, "[i]n accordance with one aspect of the present invention, a scheduled transmission protocol is implemented in the environmental monitoring and control system for promoting efficient power use and power conservation" (Hitt, [0075]). This scheduled transmission protocol includes the communication of the above-mentioned change-of-value update via the wireless communications component at regular intervals according to a schedule, or until an acknowledgement is received.

1454. For example, Hitt discloses that that either the receiving node or the sending node can schedule transmission timeslots, or negotiate timeslots for transmission. (Hitt, [0076]-[0078]). Hitt

discloses that, for example, where a receiving node schedules a transmission slot, "[t]he sensor nodes send message packets at scheduled times and the receiver node responds to transmissions with an acknowledge packet," where "[t]he acknowledge packet contains the timing information for the sensor node[']s next scheduled packet transmission and the next frequency of transmission (if frequency hopping is used)" (Hitt, [0076]). Hitt explains that "[t]he benefit of this protocol is that the sensor nodes and receiver nodes can sleep until the next scheduled transmission slot, saving a tremendous amount of power" (Hitt, [0076]). Likewise, the sending nodes can also provide the transmission schedule. (Hitt, [0077]).

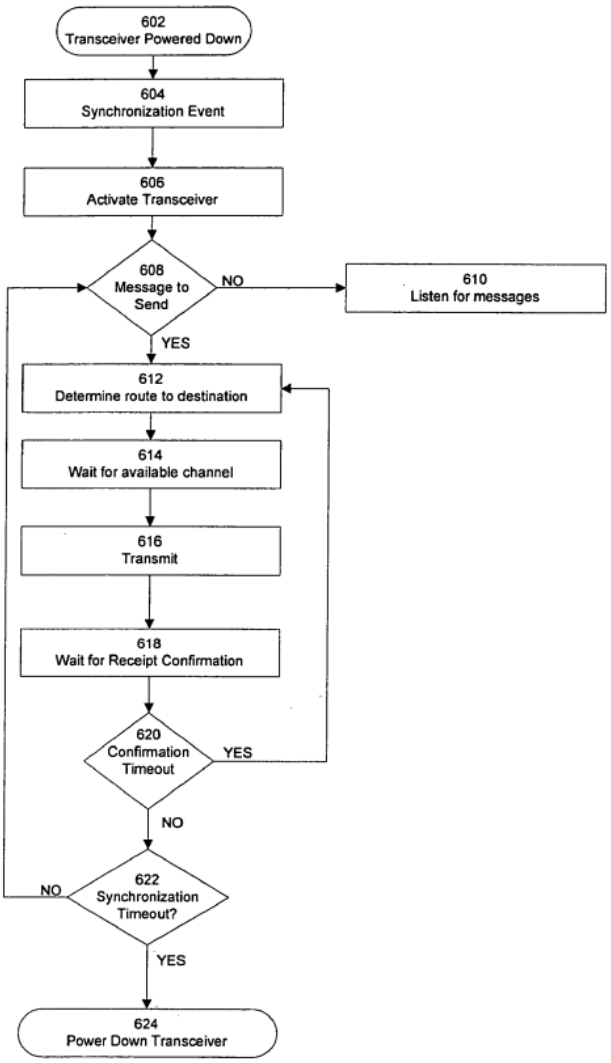
1455. Hitt further discloses exemplary flowcharts for transmission schedules where an update is communicated on a periodic schedule or until an acknowledgment packet is received. These are disclosed, for example, in Figures 4 and 6.

Figure 4 - Transceiver Routing



Reproduction of Figure 4 from Hitt

Figure 6 - Transceiver Synchronization



Reproduction of Figure 6 from Hitt

1456. With respect to the flowchart in Figure 4, Hitt explains "FIG. 4 is a flow chart illustrating the operation of each wireless node for receiving and transmitting messages within the environmental monitoring and control system according to one embodiment of the present invention. In the present embodiment, the transceivers in the wireless nodes of the system are synchronously activated to establish end-to-end network connectivity (step 402). The wireless transceiver receives an incoming message via the antenna (step 404). The transceiver receives the

incoming message, modifies the received signal, and passes the modified signal onto the processor. The processor evaluates the message to determine the intended recipient (step 406). If the intended recipient is the wireless node itself, the processor then prepares the appropriate response (step 408). The response may include collecting data from the sensor or providing a control signal to the actuator. If the intended recipient is not the wireless node itself, the processor then prepares the message to be re-transmitted to the intended recipient. Specifically, the processor of the wireless node determines the best route to the destination (step 410) and retransmits the message as necessary (step 412). The best route can be determined by the smallest number of intermediate nodes, by nodes with the maximum power available and by most reliable links. The wireless node awaits confirmation of receipt of the message (step 414). When the confirmation is not received, the wireless node attempts to retransmit the message by returning to step 410. When confirmation is received, the processing for the message is completed" (Hitt, [0064]).

1457. With respect to the flowchart in Figure 6, the disclosed operations focus on energy conservation by implementing "powered down" states. Hitt explains "FIG. 6 is a flow chart illustrating the transceiver synchronization operation according to one embodiment of the present invention. Referring to FIG. 6, in normal operation, the environmental monitoring and control system causes the transceivers of all the wireless nodes to power down (step 602). Then, when messages are to be transmitted, a synchronization event is used to synchronously bring all nodes out of a powered down state (step 604). …. After the transceiver is activated (step 606), the transceiver in a wireless node determine if it has a message to send (step 608). If not, then the transceiver listens for incoming messages (step 610). If there is a message to be sent, the transceiver determines the route to the destination (step 612). The transceiver then waits for available channel (step 614) and when a channel is available, the message is transmitted (step 616).

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The transceiver waits for receipt confirmation (step 618) from the destination node (step 618). If confirmation is not received within the timeout period (step 620), then the transceiver returns to step 612 and attempt transmission again. If confirmation is received, then the transceiver checks to see if the synchronization has timed out (step 622). If so, the transceiver is powered down (step 624). If synchronization has not yet timed out, then the operation returns to step 608 where the transceiver determines if there is a message to be sent" (Hitt, [0072]-[0073]).

1458. As discussed above, the transmitted information may be a change-of-value update that includes the plurality of change-of-value messages that are, for example, integrated at an "intermediate node" prior to further transmission. Hitt discloses, in two different embodiments, a transmission scheme to ensure reception of the update by the receiving device, where the transmission occurs at a regular interval according to a schedule or until an acknowledgement (confirmation) is received.

1459. Therefore, for at least the reasons listed above, Hitt discloses an automation component communicating a change-of-value update that includes the plurality of change-of-value messages, and repeating the change-of-value update at regular intervals according to a schedule or until a change-of-value acknowledgment is received, as required by claim element 17[c].

v.Claim 19

1460. Claim 19 of the '371 Patent recites:

> The method of claim 17, wherein each of the plurality of the change-of-value messages includes the change-of-value and a device indicator.

1461. The limitations of claim element 19 are disclosed by Hitt for at least the reasons given below.

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1462. For example, as discussed above, Hitt discloses receiving a plurality of change-of-value messages at from a plurality of wireless nodes at, for example, and intermediate node, and storing the messages at the receiving node.

1463. Hitt further discloses that the wireless nodes may also communicate device identifier or indicator information associated with received or transmitted data. For example, with respect to Fig. 2A of Hitt, Hitt states that "wireless node 150 includes an antenna 152, a wireless transceiver 154, a processor 156 and a node component 158," where "[t]he wireless transceiver of each wireless node may communicate with a memory 155 that stores a unique transceiver identifier that identifies the wireless network" (Hitt, [0046]). Hitt further states that "the transceiver in a wireless node may receive a command message on the antenna via a message protocol," where "[t]he command message may be initiated from another wireless node, or any other device connected to the system through a gateway" (Hitt, [0066]). Hitt further states that "[t]he processor may evaluate the received message to determine if the recipient's address is its own unique address," where, "[i]f it is, then the processor evaluates the command and prepares a response message." Thus, a POSITA would understand Hitt to disclose transmission of unique addresses corresponding to nodes with information from the node received.

1464. Hitt further states that, "[i]n response to the command message, the processor receives the data related to the sensor or the actuator," where "the data may be stored in the memory and the processor retrieves the data from the memory 208" and "[t]he processor may also retrieve the unique address locations of the data from the memory" (Hitt, [0067]). Hitt further discloses that the processor may thereafter "format[] a transmit signal in response to the command message as described above, and "[t]he processor then communicates the transmit signal to the transceiver, which provides the transmit signal to the wireless control system" (Hitt, [0067]).

1465. Hitt further discloses that the actuator node receiving sensor data or commands from various nodes may identify which node the data is received from based on transmitted information, and act accordingly. For example, Hitt discloses that "[i]n one embodiment, sensor data from the sensor nodes are broadcast to all nodes in the network," where "[a]ctuator nodes receiving the sensor data can selectively process the sensor data relevant to their function. For example, an actuator node in irrigation zone 1 receives data and processes the data from all sensor nodes related to the zone1 only" (Hitt, [0056]).

1466. Therefore, for at least the reasons listed above, Hitt discloses the method of claim 17, wherein each of the plurality of the change-of-value messages includes the change-of-value and a device indicator, as required by claim 19.

X. SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS

1467. I understand that Ollnova has asserted that certain secondary considerations of non-obviousness apply to the asserted claims. I have reviewed Ollnova's interrogatory response in which it argues why certain secondary considerations apply. Specifically, I have reviewed Ollnova's First Supplemental Response to Interrogatory No. 13, dated April 14, 2023, and the documents cited therein, which identifies the "secondary considerations" Ollnova asserts "should be accounted for in any analysis regarding the non-obviousness of the Asserted Claims." In my opinion, these arguments are unspecific, unconvincing, and fail to overcome the evidence of obviousness set forth in this report. I respond below to the individual factors that Ollnova discusses.

1468. As a general matter, an overall failure in Ollnova's assertion of secondary considerations is that Ollnova fails to tie its allegations to the patented claim features of the asserted claims. Counsel has informed me that the various secondary considerations of non-obviousness are only

significant if there is a nexus between the claimed invention and the stated secondary consideration. In my opinion, Ollnova has failed to show this nexus.

A. Alleged Commercial Success/Awards/Praise By Others/Copying By Others

1469. I am informed that evidence of commercial success, awards and industry praise is only significant if there is a nexus between the claimed invention and the success, awards or praise. Ollnova does not provide any nexus between the success of the companies or products identified in its interrogatory response and the patented features.

1470. Ollnova asserts that the asserted patents were "developed by Siemens Building Technologies, Inc. (a subsidiary of Siemens AG, 'Siemens') and Siemens has received significant praise for its innovations in automated building systems." Ollnova then cites to certain articles referring to awards received by Siemens, some in reference to a particular product (e.g., APOGEE), some not.[19] Based on my review, Ollnova has not tied any awards or praise for Siemens to any particular patent or patented feature. Ollnova seems to be assuming that the awards and praise are necessarily related to the four asserted patents in this lawsuit; however, I see no reason why that assumption would be correct particularly where, for example, the cited articles do not mention any particular patents and some articles predate some of the asserted patents. Further, I understand that Ollnova has taken the position in this lawsuit that Siemens' APOGEE product does not practice any asserted patent, and therefore it is unclear how an award relating to that product could demonstrate any secondary considerations with respect to the asserted patents.

[19] https://www.achrnews.com/articles/101504-oct-6-2006-siemens-building-automationsystem-receives-innovation-award [OLLNOVA-ECO-00014025 - OLLNOVA-ECO-00014028]; https://www.ifsecglobal.com/fire-news/siemens-building-technologies-scoops-frost-sullivanbuilding-tech-award/ [OLLNOVA-ECO-00014029 - OLLNOVA-ECO-00014034]; https://new.siemens.com/us/en/products/automation/systems/industrial/industry-awards.html [OLLNOVA-ECO-00014035 - OLLNOVA-ECO-00014052]; https://www.govconwire.com/2022/06/sgt-receives-295m-army-contract-for-buildingautomation-systems-services/ [OLLNOVA-ECO-00014053 - OLLNOVA-ECO-00014058].

1471. Further, I do not believe any success by Siemens has been tied to the four specific patents asserted in this lawsuit. For example, a simple search on the USPTO's assignment database alone returns 244 patents and/or applications assigned to Siemens,[20] and this likely does not account for all technology designed or developed by Siemens relating to its products. Ollnova has not demonstrated that any praise or award is a result of the asserted patents, instead of the many other patents assigned to Siemens.

1472. Further, Ollnova has not demonstrated any commercial success by any particular Siemens product. Ollnova has demonstrated that a product (APOGEE) existed but not that the product was commercially successful, much less commercially successful due to any patented feature related to the asserted patents.

1473. Ollnova also does not cite to any instances of industry praise that relate to the patented features (as opposed to the products generally). I understand that the products Ollnova has accused of infringing the asserted claims in this and other lawsuits are smart thermostats (i.e., thermostats that may communicate to remote devices). These products have myriad features that are not covered by the asserted claims, and Ollnova has not explained how (and does not appear to allege that) commercial success or industry praise for the accused products is due to the asserted patents' claimed features as opposed to the many and varied features of the accused products that have nothing to do with the patent but form the core essence of the accused products.

1474. Further, Ollnova has not demonstrated that any products "sold by Emerson, Google, Resideo, Carrier, and ecobee" actually do practice any asserted claim of the asserted patents. I understand that Ollnova ***alleges*** that to be the case in this lawsuit, but that allegation does not demonstrate a nexus between the asserted claims and any alleged success of those products.

[20] *See* https://assignment.uspto.gov/patent/index.html#/, last accessed April 21, 2023.

Ollnova also provides no indication of a nexus at all for the products produced by the other companies identified in its interrogatory response, and I am not aware of any.

1475. Furthermore, as noted above, I understand that for any success of an invention to be relevant it must be attributable to the claimed invention rather than to other factors such as market power, advertising, demand for all products of a given type, a rising economy that helps all products, etc. Ollnova does not appear to account for this in its interrogatory response. For example, Ollnova relies on the alleged commercial success of products "sold by Emerson, Google, Resideo, Carrier, and ecobee" but does not appear to account for the fact that these are generally well-known brands in the marketplace whose sales are not necessarily tied to particular product features (much less allegedly novel features recited in the asserted patents). Ollnova does not appear to identify any documents or other information indicating that the commercial success of any particular company is a result of practicing Ollnova's patents. Indeed, Ollnova does not demonstrate that any such product sold by the identified companies actually does practice any patents. It is my understanding that a company needs to practice a patent that it licenses, particularly when the license is the result of an effort to resolve a pending lawsuit against it (and not, for example, an affirmative effort by a party to license technology it intends to use).

1476. Ollnova cites to, for example, Form 10-K filings for various companies to allege that products of those companies have "garnered significant commercial success,"[21] but I again do not

[21] https://abc.xyz/investor/static/pdf/20230203_alphabet_10K.pdf?cache=5ae4398 (Alphabet/Google Dec. 2022 10-K) [OLLNOVA-ECO-00014059 - OLLNOVA-ECO-00014150]; https://www.emerson.com/documents/corporate/form-10-k-en-us-8673712.pdf(Emerson Dec. 2022 10-K) [OLLNOVA-ECO-00014151 - OLLNOVA-ECO-00014233]; https://s27.q4cdn.com/999644081/files/doc_financials/2022/q4/Q4-22-Earnings-Presentation-Final.pdf (Resideo Dec. 2022 10-K) [OLLNOVA-ECO-00014234 - OLLNOVA-ECO-00014250]; https://ir.carrier.com/sec-filings/sec-filing/10-k/0001783180-23-000012 (Carrier Dec2 022 10-K) [OLLNOVA-ECO-00014251 - OLLNOVA-ECO-00014388]; https://investors.generac.com/sec-filings/sec-filing/10-k/0001437749-23-004153 (Generac Dec 2022 10-K) [OLLNOVA-ECO-00014389 - OLLNOVA-ECO-00014485].

observe any connection to the general financial statements in these filings and any actual patented features claimed in the asserted patents, much less the specific subset of accused products and accused features at issue in Ollnova's patent claims against such companies.

1477. Ollnova refers to "copying by others" in a section title but does not actually identify any alleged copying by any other. From what I can tell, Ollnova appears to generally refer to the licensing of the asserted patents by certain companies, and Ollnova's allegation in lawsuits that those companies practiced the asserted patents. As an initial matter, I understand from counsel that every license that a company has taken to any asserted patent has been in the form of a portfolio license to ***all*** of Ollnova's patents, which portfolio contains over 100 patents. Ollnova has not demonstrated that any licensing by another party was based on any particular patent within Ollnova's portfolio, or attributable to the asserted patents themselves. I further understand that not all four asserted patents were asserted against entities that have taken a license to Ollnova's portfolio, and thus it is further unclear what the nexus is. Further, as noted above, Ollnova has not demonstrated that any of those parties actually has practiced any of the asserted patents, and I am not aware of any statement by any party that it has practiced (or infringed) any asserted patent. Therefore, it is again unclear as to what nexus could exist.

1478. Ollnova further argues that "ecobee's own statements" further demonstrate that "the patented technologies were not well-understood, routine, or conventional at the time of the invention." However, Ollnova has not identified any particular statements in its interrogatory response other than generally referring to its infringement contentions, and it is therefore unclear what, if any, statements Ollnova could be referring to, or what the alleged nexus would be between those statements and the allegedly novel features of the asserted claims.

1479. Finally, Ollnova argues that "[p]raise and utilization of Ollnova's patented inventions" is demonstrated by other patents and applications citing to the asserted patents in USPTO proceedings. However, I understand that in USPTO patent prosecution proceedings an applicant has a general duty to disclose information to the examiner that may impact patentability, and that an applicant can also disclose other art that may be of any relevance. I have not been made aware of any rule or requirement that indicates that a citation to prior art in a USPTO proceeding is an indication of praise or utilization of that prior art, and Ollnova has not made any such indication in its interrogatory response. Therefore, I see no relevance to the general citation of the asserted patents by others in USPTO proceedings, or any nexus to any praise or utilization of the allegedly novel features of any asserted claims.

1480. Therefore, in my opinion, these arguments fail to demonstrate the non-obviousness of any asserted claim.

B. Alleged Long-Felt But Unresolved Need/Failure of Others/Skepticism By Experts/Unexpected Results

1481. In support of these secondary considerations, Ollnova asserts that "[t]he Asserted Patents all address technological problems and provide technical solutions in automated building systems that were not well-understood, routine, or conventional at the time of the inventions," followed by Ollnova's characterizations of what each of the asserted patents are directed to. As a general matter, for the reasons stated herein, I disagree that any asserted claim is directed to subject matter that was not well-understood, routine, or conventional at the time of the earliest priority dates for those claims. Furthermore, the mere fact that the patents issued and are allegedly directed to the subject matter summarized by Ollnova does not demonstrate any long-felt need, failure of others, skepticism by experts or unexpected results. Indeed, Ollnova fails to identify any facts or evidence

to support these secondary considerations or provide a nexus between such considerations and the allegedly novel features of any asserted claim, and I am not aware of any.

1482. Ollnova also appears to assert that these secondary considerations can be found in the asserted claims because the Court found asserted claims of three of the four patents ('282, '887 and '371 patents) to be directed to subject matter that is not abstract, while finding that the '495 patent is directed to an abstract idea.[22] I understand that the Court's ruling was made in the context of determining whether the asserted patents claimed patent-eligible subject matter under 35 U.S.C. § 101, which is a threshold requirement for seeking patent protection over subject matter. Thus, even in view of the Court's ruling for three of the four patents, it is unclear to me how the Court's finding that three of the four patents were directed to patent-eligible subject matter serves to demonstrate any long-felt need, failure of others, skepticism by experts or unexpected results, much less a nexus between such considerations and any allegedly novel features of any asserted claims.

1483. Therefore, in my opinion, these arguments fail to demonstrate the non-obviousness of any asserted claim.

C. Alleged Teaching Away By Others

1484. Ollnova does not set forth any specific arguments in support of its apparent belief that there exists "teaching away by others" with respect to the asserted claims. Instead, Ollnova generally cites to the "respective file histories" for the asserted patents generally, Ollnova's "claim construction briefing" and "its forthcoming expert validity report(s)," as well as "its response to the petition for *inter partes* review filed by ecobee."

[22] See Ollnova Tecs. Ltd. v. ecobee Techs. ULC, No. 2:22-cv-00072-JRG, Dkt. No. 63 (E.D. Tex. Sept. 21, 2022).

1485. As a general matter, I am not aware of anything in these documents that have been produced to date that allegedly demonstrates teaching away, and Ollnova has not identified anything in its interrogatory response making any such demonstration. To the extent that Ollnova references prior art that was distinguished by the applicants during prosecution of the asserted patents or during *inter partes* review proceedings before the USPTO, it is unclear how that alone demonstrates teaching away. For example, Ollnova's contention that certain prior art does not disclose all limitations of certain asserted claims does not itself demonstrate that the prior art actually teaches away from the allegedly novel aspects of any asserted claim, and Ollnova has not identified a single piece of prior art or statement in the industry at the time indicating that anyone sought to "teach away" from the subject matter claimed in the asserted claims. To the contrary, as demonstrated herein, the subject matter of the asserted claims was well known, and numerous references pre-dating the asserted patents taught precisely what is claimed. Therefore, if anything, the state of the art taught what was claimed, and not away from it.

1486. Therefore, in my opinion, these arguments fail to demonstrate the non-obviousness of any asserted claim.

D. No Other Secondary Considerations

1487. Ollnova does not identify any other alleged secondary considerations for the asserted claims, and I am not aware of any that would apply. I reserve the right to supplement my report and/or my opinions concerning obviousness of the asserted claims with respect to alleged secondary considerations, to the extent that Ollnova or its experts raise new or different arguments that are outside the scope of its interrogatory response.

XI. OPINIONS REGARDING CONVENTIONAL COMPONENTS AND ARRANGEMENTS

1488. It is my opinion that for each asserted patents, the asserted claims recite only well-known and conventional technology, that is used in a conventional, routine and expected manner. This remains true for the ordered combination of components recited in the claims, which are arranged in a conventional manner and perform routine operations (such as receiving and communicating information, storing information and processing information) in an expected and conventional manner. There is nothing in the patents or other intrinsic evidence suggesting that any component, or arrangement of components, is novel or unique when viewed at the time of the earliest priority dates of the asserted patents.

A. '282 Patent

1489. Claim 1 of the '282 patent recites a process of receiving a certain type of information, and, in response, communicating stored information in response. The claim is carried out using an "automation component" that includes "a multi-sensor package," "a wireless communications component," "a processor" and "a memory" used to perform certain functionality. The '282 patent itself explains that these components are conventional and used in a conventional manner.

1490. For example, a "multi-sensor package" is just a package of conventional sensors that "may" be configured to detect various possible "variables" ("for example, temperature, humidity, carbon dioxide, carbon monoxide, volatile organic compounds, etc.," '282 patent, 6:22-39). The patent does not describe any specific design, structure, configuration or special functionality required for the recited "package," or describe how it would differ over existing conventional multi-sensor packages (e.g., *Id.*, 2:31-35; 6:22-39, 6:46-51; 8:65-9:1; 9:44-47; 10:17-29; Fig. 2). Indeed, a POSITA would be well aware of many commercial of-the-shelf components that constitute or include a multi-sensor package. The concept of using two or more conventional sensors together

in a "package" was well known in the art at the time, as demonstrated, for example, by the prior art cited and discussed above, as well as other prior art in the field of building automation systems. For example, Ahmed states that "[i]n accordance with one aspect of the invention, several known MEMS sensing technologies are incorporated into a single substrate" and that "[a]s a consequence, a manner, a single sensor module design may be used in a large number of building automation and/or safety applications" (Ahmed, [0032]-[0033], [0057]). As another example, Liu states that "[a]ccording to embodiments of the present invention, an individual sensor package is provided, which includes one or more sensors, plus signal processors for receiving and processing the signals from the sensors" wherein "[t]he sensor package may also record, store, or analyze data and/or address detected environmental conditions based on the data to some degree," (Liu, [0015]-[0016]). Still further, McFarland states that "[i]n one embodiment, the sensor 30 includes a suit of sensors for sensing multiple environmental conditions," (McFarland, [0035]). Kates states that "[i]n the sensor unit 102, one or more sensors 201 and a transceiver 203 are provided to a controller 202" (Kates, [0029], [0031]-[0038], [0050]-[0051], [0052]). As a final example, Hitt states that "[i]n one embodiment, the sensor component can be any one of or a combination of: an air temperature sensor, a relative humidity sensor, a light level sensor, a soil moisture sensor, a soil temperature sensor, a soil dissolved oxygen sensor, a soil pH sensor, a soil conductivity sensor, a soil dielectric frequency response sensor" (Hitt, [0046], [0049], [0050], Fig. 2A).

1491. The '282 patent similarly describes the remaining hardware recited in the claim as generic and conventional. For example, with respect to the "wireless communication component," the '282 patent describes "example" conventional wireless communications components, which are "not intended to limit the type, functionality and interoperability of the devices … claimed herein" ('282 patent, 3:52-4:46). With respect to the "processor," the '282 patent describes the use of

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conventional processors "such as an INTEL® PENTIUM, an AMD® ATHLON™, an Atmel® ATMega, or other 8, 12, 16, 24, 32 or 64 bit classes of processors" (*Id.*, 5:57-62). With respect to the memory, the '282 patent describes conventional types of memory such as random access memory (RAM) or read only memory (ROM), as well as "any other known or contemplated storage device or mechanism" (*Id.*, 5:62-66).

1492. These components are all conventional and used in their conventional manner, including in the ordered combination recited in the claims, as further demonstrated above with respect to prior art invalidity for the '282 patent asserted claims. There is nothing in the claims, the specification or the prosecution history to suggest that the claims contemplate any new or different components or arrangement.

1493. Furthermore, the recited conventional components are used to perform routine and conventional functions, such as generate sensor data, scan sensor data, receive information, communicate information, identify information. This is further true for the remaining '282 patent asserted claims, which simply recite functionality that is or can be carried out using the conventional components and component arrangement recited in claim 1. There is nothing in the patent or other intrinsic evidence suggesting that non-conventional components, or a non-conventional arrangement of components, would be necessary to carry out the '282 patent asserted claims.

B. '887 Patent

1494. Claim 1 of the '887 patent recites a process of selectively communicating (or not communicating) information at certain times related to how sensed conditions have or have not changed. The claim is carried out using a "wireless automation device" that includes "a transceiver," "a sensor," "a controller" and "a memory" used to perform certain functionality. The

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’887 patent itself explains that these components are conventional and used in a conventional manner.

1495. For example, the ’887 patent states that the recited “transceiver” can generally be any “RF transceiver, RF transmitter, and/or RF receiver or other device that wirelessly communicates packets of information over a wireless network” (’887 patent, 2:8-45). The patent further describes the recited “controller” generically as any device that receives information and generates control signals (*Id.*, 1:23-26; 4:33-36; 13:36-55). The “memory” is similarly described generically as a medium for storing information (*Id.,* 7:30-41). The “sensor” is also described generically as any sensing device that can “sense conditions, parameters and/or events such as an environmental condition in a building” (*Id.*, 8:46-65).

1496. These components are all conventional and are used in their conventional manner, including in the ordered combination recited in the claims, as further demonstrated above with respect to prior art invalidity for the ’887 patent asserted claims. There is nothing in the claims, the specification or the prosecution history to suggest that the claims contemplate any new or different components or arrangement.

1497. Furthermore, the recited conventional components are used to perform routine and conventional functions, such as generate and store sensor data, poll components to read information, and conditionally transmit (or suspend transmission of) information. This is further true for the remaining ’887 patent asserted claims, which simply recite functionality that is or can be carried out using the conventional components and component arrangement recited in claim 1. There is nothing in the patent or other intrinsic evidence suggesting that non-conventional components, or a non-conventional arrangement of components, would be necessary to carry out the ’887 patent asserted claims.

C. ’495 Patent

1498. Claim 1 of the ’495 patent generally recites a system for controlling certain components using information from two separate networks in a particular manner. The claim is carried out using a first and a second “wireless network,” “sensors,” and “building components” used to perform certain functionality. The ’495 patent itself explains that these components and features are conventional and used in a conventional manner.

1499. For example, with respect to the first and second wireless networks, the patent explains that each of these networks can be a well-known and conventional wireless network used in its intended and conventional manner. In this regard, the patent describes the use of well-known existing networks (or any network that might be developed in the future): “Each network operates pursuant to different wireless communications protocols. For example, the lower level network 14 operates pursuant to the 802.15.4 communications protocols, but Bluetooth, proprietary, standard, now known or later developed wireless communication protocols may be used. The high level network 14 operates pursuant to the 802.11x protocol (e.g., 802.11a 802.11b, 802.11c … 802.11g), but wifi [*sic*], computer network, Ethernet, proprietary, standard, now known or later developed protocols may be used. 802.15.4 and 802.11x provide medium access control and a physical interface to wireless medium. Any now known or later developed network and transport algorithms may be used. Communication, transport and routing algorithms are provided on the appropriate devices. Any packet size or data format may be used” (’495 patent, 5:8-22).

1500. The ’495 patent also describes the recited “sensors” generically as any “now known or later developed sensors,” and provides some examples of conventional sensors (*Id.*, 6:53-60). The term “building components” is itself does not connote any particular non-conventional component or arrangement of components, and the patent generally uses this term to refers to the use of any components in a building, existing or otherwise. For example, the ‘’495 patent states that “[p]eak

demand limiting is used to control an overall power usage by a building, such as controlling power used by chillers, boilers, air handlers, lighting, or other building components" (*Id.*, 12:56-61).

1501. These components are all conventional and are used in their conventional manner, including in the ordered combination recited in the claims, as further demonstrated above with respect to prior art invalidity for the '495 patent asserted claims. There is nothing in the claims, the specification or the prosecution history to suggest that the claims contemplate any new or different components or arrangement.

1502. Furthermore, the use of two different networks utilizing two different wireless communications protocols was well known and conventional at the time. A communications protocol is a set of rules governing how devices on a network exchange information with each other. Thus, in view of the patent's disclosure, this feature simply describes, for example, the use of two or more of the well-known and conventional wireless network protocols identified in the patent itself ('495 patent, 5:8-22). The patent does not state or suggest any such communication protocol, or use of multiple protocols, was invented by the applicant or was otherwise non-conventional at the time. This is further demonstrated by the existence of this conventional arrangement in the prior art, as demonstrated above concerning prior art invalidity of the '495 patent asserted claims. By way of example, both Mesarina and Hermann expressly disclose the use of two different networks utilizing two different wireless communications protocols in a building automation system (*See,* e.g., Mesarina at 2:52-55; Herrmann at [0018]-[0019], [0026], [0028], [0041]-[0042]).

1503. For example, network communications had long utilized the concept of local networks connected by wider area network. Indeed, the concept of a "network of networks" is fundamental to the architecture of the Internet, in which multiple LANs are connected by WANs that are

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publicly available and global in extent to form the ubiquitous Internet. More specifically, a POSITA would recognize that many buildings or facilities (e.g., offices, homes, and the like) utilize a LAN for networked devices within the individual building to communicate via a router, where these devices communicate with other nodes in other LANs via the Internet through a gateway device such as a modem (which may be built into the same router device in some examples). A POSITA would also be aware of various remote access and distributed control systems in which operations of a local network utilize inputs from remove devices located in different LANs. As another example, industrial plant control systems use Programmable Logic Controllers (PLCs) and Distributed Control Systems (DCSs) wherein local controllers (typically the PLCs) independently manage certain functions while also being able to respond to commands from higher level networks (typically the DCS). These systems have been in use in this way for decades.

1504. Furthermore, the recited conventional components are used to perform routine and conventional functions, such as provide access to communications or information from other components, generally "control" other components, and run building components. This is further true for claim 2, which simply specifies that one of the wireless networks has a bandwidth that is less than the other wireless network. Different networks having different bandwidths was well known in the art, including in view of the patent's own disclosure (discussed above), and in view of the prior art discussed above with respect to the '495 patent. There is nothing in the patent or other intrinsic evidence suggesting that non-conventional components, or a non-conventional arrangement of components, would be necessary to carry out the '495 patent asserted claims.

D. '371 Patent

1505. Claim 1 of the '371 patent recites a process of receiving a request for a certain type of information, and, in response, communicating certain information at regular intervals or until a

certain type of acknowledgment has been received. The claim is carried out using an "automation component" that includes "wireless communications component," "a processor," and "a memory" used to perform certain functionality. The '371 patent itself explains that these components are conventional and used in a conventional manner.

1506. For example, similar to the disclosure of the '282 patent, the '371 patent describes "example" conventional wireless communications components, which are "not intended to limit the type, functionality and interoperability of the devices … claimed herein" ('371 patent, 3:26-4:21). The patent also describes the recited "processor" and "memory" generically, providing examples of conventional "processor" and "memory" components that can be used to practice the claims when used in a conventional manner (*Id.*, 5:32-41).

1507. These components are all conventional and are used in their conventional manner, including in the ordered combination recited in the claims, as further demonstrated above with respect to prior art invalidity for the '371 patent asserted claims. There is nothing in the claims, the specification or the prosecution history to suggest that the claims contemplate any new or different components or arrangement.

1508. Furthermore, the nature of the information generated and communicated in the claims ("change-of-value" information) does not change the conventional nature of the recited components and their conventional arrangement within the claims. For example, the '371 patent explains that the term "change-of-value" is used to refer to an indication that "denotes that the information, setting, signals and/or indications stored within the memory 204 have been altered, updated or otherwise changed" (*Id.*, 6:10-17). The '371 patent does not describe this data of being of a unique nature that would require non-conventional components or specialized computing equipment to generate or communicate. The other recited functionality (e.g., "pushing" and

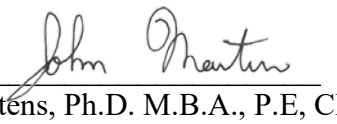
"polling" information) described in the claims and in the patent was also already conventional at the time (*Id.*, 6:21-35).

1509. The recited conventional components are used to perform routine and conventional functions, such as process, generate, communicate and store information. This is further true for the remaining '371 patent asserted claims, which simply recite functionality that is or can be carried out using the conventional components and component arrangement recited in claim 1. There is nothing in the patent or other intrinsic evidence suggesting that non-conventional components, or a non-conventional arrangement of components, would be necessary to carry out the '371 patent asserted claims.

XII. DECLARATION

1510. I declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code.

April 24, 2023
Date



John Martens, Ph.D. M.B.A., P.E, CFEI

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