

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Title: REMOTE WAKEUP METHOD, CONNECTION SERVER, AND
NETWORKING APPARATUS HAVING SLEEP MODE

DECLARATION OF VLAD KARDASHOV

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I, Vlad Kardashov of Toronto, Ontario, declare that:

I. INTRODUCTION

1. My name is Vlad Kardashov, and I have been retained by counsel for Petitioner Reolink Innovation Inc. (“Reolink” or “Petitioner”) as an expert witness to provide assistance regarding U.S. Patent No. 10,602,448 (“the ’448 Patent”). Specifically, I have been asked to consider the validity of claims 1-3, 5, 7-13, 15-19, and 23-25 of the ’448 Patent (the “Challenged Claims”).

2. I am being compensated for my time at my standard consulting rate. I am also being reimbursed for expenses that I incur during the course of this work. My compensation is not contingent upon the results of my study, the substance of my opinions, or the outcome of any proceeding involving the Challenged Claims. I have no financial interest in the outcome of this matter or on related litigation involving the ’448 Patent.

3. My analysis here is based on my years of education, research and experience, as well as my investigation and study of relevant materials, including those cited herein. I may rely upon these materials, my knowledge and experience, and/or additional materials to further explain and corroborate my analysis, and to respond to critiques of my analysis raised by Throughtek Technology Co. Ltd. (“Throughtek ” or “Patent Owner”) or the Patent Trial and Appeal Board (“Board”).

4. My analysis of the materials produced in this proceeding is ongoing and I will continue to review any new material as it is provided. This declaration represents only those opinions that I have formed to date. I reserve the right to revise, supplement, and/or amend my opinions stated herein based on new information and on my continuing analysis of the materials already provided.

II. BACKGROUND AND QUALIFICATIONS

5. I am over the age of 18 and am competent to provide this testimony. I have personal knowledge, or have developed knowledge of the technologies addressed in this declaration based upon my education, training, experience, and my review of the '448 Patent, its file history, and the related prior art.

6. I am well qualified to serve as a technical expert in this matter based upon my qualifications, discussed in detail below.

7. I am an expert in the field of computer networks and cloud-based technologies. I have developed products in this field for over 20 years. I have summarized in this section my educational background, work experience, and other relevant qualifications. Attached hereto as Appendix A, is a true and correct copy of my curriculum vitae ("CV") that further my background and experience.

8. In 2002, I earned my Bachelor of Science degree in Electrical Engineering and from The Singalovsky College in Tel Aviv, Israel. Upon earning my degree, I entered industry as an electrical and systems engineer. Over my career,

I advanced to senior executive roles in research and development as Director, Vice President, and President. I am currently serving as the President of a cloud technology company.

9. From 2001 to 2005, I worked at Pelephone, one of the largest mobile service providers in Israel. My work at Pelephone included roles as a system validation engineer and engineering manager. In these roles, I developed and improved technologies involving mobile networks and device connectivity using these networks. Following my time at Pelephone, I worked as a senior executive in research and development at two additional technology companies from 2009 to 2012 where I developed products to improve the user experience in mobile networks.

10. From 2012 to 2016, I was employed as the Director of Engineering & Product Development at Lorex Technology, Inc. (acquired by FLIR Systems, Inc. in 2012), which produced a variety of networked video recording and streaming systems, including the Lorex LH150 ECO4 Series of DVR, which was capable of streaming live or recorded video signals from one or more video cameras connected to the DVR to a remote device (e.g., a smartphone, tablet, or PC) over the Internet via a P2P connection. My work at Lorex Technology included managing the product design of the Lorex DVRs, IP cameras, and related networked products, managing the team that was responsible for cloud-based services—including Lorex's network servers involved in establishing direct P2P connectivity between DVRs and client

devices. I also managed development of the Lorex ECO Stratus mobile app and corresponding PC/Mac desktop apps that allowed our customer's personal devices to receive and play video streams from LH150 ECO4 Series DVRs over a P2P connection. Based on my responsibilities as a Project Lead and IP Products Line Manager, I had personal knowledge of, and was highly familiar with, the Lorex LH150 ECO4 Series DVRs, the Lorex ECO Stratus app/service, Lorex's network server system, and all of the instructions/user manuals/literature/how-to videos that were published by Lorex Technology during 2012 and later.

11. From 2016 to 2020, I served as Vice President (Engineering) at FLIR Systems, Inc., serving in FLIR's security division (again, FLIR Systems had previously acquired Lorex Technology). During that time, I continued to manage Lorex Technology (engineering and product development) and also FLIR Security research and design. In 2018, FLIR Systems, Inc. sold Lorex Technology to Dahua Technology, and my role stayed with FLIR Systems, Inc. at that time. I managed Lorex's technology during this transition.

12. I am currently the President of iENSO, a technology company that develops and manufactures cloud-connected imaging systems. As the President of iENSO, I oversee the development of our products which include embedded cameras for smart appliances, security cameras, and imaging systems for autonomous vehicles and drones. I also oversee development of iENSO's cloud platform which

supports many of our imaging products and allows users to store data, perform data analysis, and manage connected devices.

III. LEVEL OF ORDINARY SKILL IN THE ART

13. In rendering the opinions set forth in this declaration, I was asked to consider the patent claims and the prior art through the eyes of a person of ordinary skill in the art as of the effective filing date of the '448 Patent ("POSITA"), which I have concluded is August 29, 2016—the filing date of a related priority patent application. I understand that the factors considered in determining the ordinary level of skill in a field of art include the level of education and experience of persons working in the field; the types of problems encountered in the field; the teachings of the prior art; and the sophistication of the technology at the time of the alleged invention. I understand that a POSITA is not a specific real individual, but rather is a hypothetical individual having the qualities reflected by the factors above. I understand that a POSITA also would have knowledge from the teachings of the prior art, including the art cited below.

14. Taking these factors into consideration, on or before August 29, 2016, a POSITA relating to the technology of the '448 Patent would have had a Bachelor's degree in electrical engineering and two years of work experience with network and communication technologies.

15. By August 29, 2016, my education and work experience was at least that of a POSITA. I am qualified to provide opinions concerning what a POSITA would have known and understood at that time, and my analysis and conclusions herein are from the perspective of a POSITA as of that date.

IV. MATERIALS CONSIDERED AND RELIED UPON

16. In forming my opinions and reaching the conclusions described in this declaration, I have relied on the documents and materials cited herein as well as those identified in this declaration, including the '448 Patent, the prosecution history of the '448 Patent, and prior art references cited herein. These materials comprise patents, related documents, and printed publications. Each of these materials is a type of document that experts in my field would have reasonably relied upon when forming their opinions. I have also relied on my education, training, research, knowledge, and personal and professional experience in the relevant technologies and systems that were already in use prior to, and within the timeframe of the earliest effective filing date of the '448 Patent (August 29, 2016).

17. Accordingly, as part of my independent analysis of the '448 patent, I have analyzed the following publications and materials:

<u>Exhibit</u>	<u>Description</u>
EX1001	U.S. Patent No. 10,602,448 to Luna (“the '448 Patent”)
EX1002	Prosecution History of the '448 Patent (“the Prosecution History”)

<u>Exhibit</u>	<u>Description</u>
EX1004	U.S. Patent Publication No. 2014/0298066 (“Zhang”)
EX1005	U.S. Patent Publication No. 2009/0210519 (“Zill”)
EX1006	U.S. Patent Publication No. 2017/0366753 (“Liu”)
EX1008	Certified Translation of Chinese Patent Application No. 201610422371.8 (“Liu Foreign Priority Application”)
EX1009	Chinese Patent Application No. 201610422371.8 (“Liu Foreign Priority Application”)
EX1010	U.S. Patent Publication No. 2015/0074432 (“Winter”)
EX1011	U.S. Patent Publication No. 2010/0262681
EX1012	U.S. Patent Publication No. 2016/0234783
EX1013	U.S. Patent Publication No. 2014/0129859
EX1014	U.S. Patent Publication No. 2013/0212413
EX1017	Postel, J., "Internet Protocol", STD 5, RFC 791, DOI 10.17487/RFC0791, September 1981, < https://www.rfc-editor.org/info/rfc791 >

18. Although this declaration refers to selected portions of the cited references, it should be understood that these are examples, and I recognize that a POSITA would have viewed the references cited herein in their entirety and in combination with other references cited herein or cited within the references themselves.

V. LEGAL STANDARDS

19. I am not a lawyer and do not provide any legal opinions, but I have been advised that certain legal standards are to be applied by technical experts in forming opinions regarding meaning and validity of patent claims I have applied the legal standards described below, which were provided to me by counsel for the Petitioners.

20. It is my understanding that assessing the validity of a U.S. patent based on a prior art analysis requires two steps. First, one construes the terms of the patent claims to understand what meaning one of ordinary skill in the art would have given the terms. Second, after the claim terms have been construed, one then assesses validity by comparing the patent claim properly construed to the “prior art.” I understand that the teaching of the prior art is viewed through the eyes of a POSITA as of the effective filing date of the ’448 Patent. My analysis as to what constitutes a POSITA is set forth above (§III).

A. Legal Standards for Prior Art

21. I understand that a patent or other publication must first qualify as prior art before it can be used to invalidate a patent claim. Counsel for Petitioners have informed me that Zhang (EX1004), Zill (EX1005), and Liu (EX1006), all qualify as prior art to the ’448 Patent.

B. Legal Standard for Priority Date

22. I understand that the “priority date” or “earliest effective filing date” of a patent claim is the date on which the patent was filed, or the date on which an earlier-filed U.S., foreign, or international patent application was filed if the patentee claims the benefit of priority to that earlier-filed application and that earlier-filed application provides enabling disclosure of the patent’s claimed subject matter.

C. Legal Standard for Obviousness

23. My understanding is that a patent claim is invalid as obvious only if the subject matter of the claimed invention “as a whole” would have been obvious to a POSITA as of the earliest effective filing date of that patent claim. To determine the differences between a prior art reference (or a proposed combination of prior art references) and the claims, the question of obviousness is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious.

24. It is my understanding that there is no single way to define the line between true inventiveness on one hand—which is patentable—and the application of common sense and ordinary skill to solve a problem on the other hand—which is not patentable. For instance, factors such as market forces or other design incentives may be the source of what produced a change, rather than true inventiveness.

25. I understand that, when assessing obviousness, one may consider whether the change was merely the predictable result of using prior art elements according to their known functions, or whether it was the result of true inventiveness. And, one may consider whether there is some teaching or suggestion in the prior art to make the modification or combination of elements recited in the claim at issue. Also, one may consider whether the innovation applies a known technique that had been used to improve a similar device or method in a similar way and whether the claimed invention would have been obvious to try. In determining whether the claimed invention would have been obvious to try, the claim must be directed to a relatively small number of possible approaches to the problem for which a POSITA would have reasonably expected success implementing before the earliest effective filing date.

26. I understand that obviousness is assessed through the eyes of a POSITA as of the earliest effective filing date and that one should not consider what is known today or what is learned from the teaching of the patent.

27. I understand that an obviousness determination entails consideration of the scope and content of the prior art; the difference or differences, if any, between the claim of the patent and the prior art; the level of ordinary skill in the art at the time the claimed invention was made; and, if available, objective indicia of non-obviousness, also known as “secondary considerations.”

28. I understand that the secondary considerations can include: commercial success of a product due to the merits of the claimed invention; a long felt need for the solution provided by the claimed invention; unsuccessful attempts by others to find the solution provided by the claimed invention; copying of the claimed invention by others; unexpected and superior results from the claimed invention; acceptance by others of the claimed invention as shown by praise from others in the field or from the licensing of the claimed invention; teaching away from the conventional wisdom in the art at the time of the invention; independent invention of the claimed invention by others before or at about the same time as the named inventor thought of it; and other evidence tending to show obviousness. I understand that, to establish a secondary consideration, the evidence must demonstrate a nexus between that secondary consideration and the claimed invention.

VI. OVERVIEW OF THE '448 PATENT

A. Subject Matter Overview

29. The '448 Patent is titled "Remote Wakeup Method, Connection Server, and Networking Apparatus Having Sleep Mode" and describes a remote wakeup method for a network apparatus having a sleep mode. EX1001 at Title and Abstract. The '448 Patent describes a system that includes a connection server, a first apparatus (i.e., a requesting apparatus), and a second apparatus (i.e., a sleep-enabled apparatus). EX1001 at 2:29-42. The "[requesting] apparatus can be provided to use

a device identifier of the [sleep-enabled] apparatus to directly initiate a wakeup request (a wakeup request packet) to the remote [sleep-enabled] apparatus by means of the connection server.” EX1001 at 2:33-37.

30. I note that the ’448 patent refers to the device requesting to wake-up a sleeping device as the “first” apparatus, and the sleeping device as the “second” apparatus. EX1001, Cl. 1. Zhang uses the opposite “second”/“first” notation, referring to the device requesting to wake-up a sleeping device as the “second” computer system (or “end user”) and the sleeping device as the “first” computer system (or “sleeping client”). *See* below in Section VII.A. For clarity, I use “requesting” apparatus/computer as the claimed “first” apparatus, and “sleep-enabled” apparatus/computer as the claimed “second” apparatus in this declaration.

31. Figure 1A shows an example of the ’448 Patent’s system with “a [requesting] apparatus 110,” “a [sleep-enabled] apparatus 130,” and “a connection server 150”:

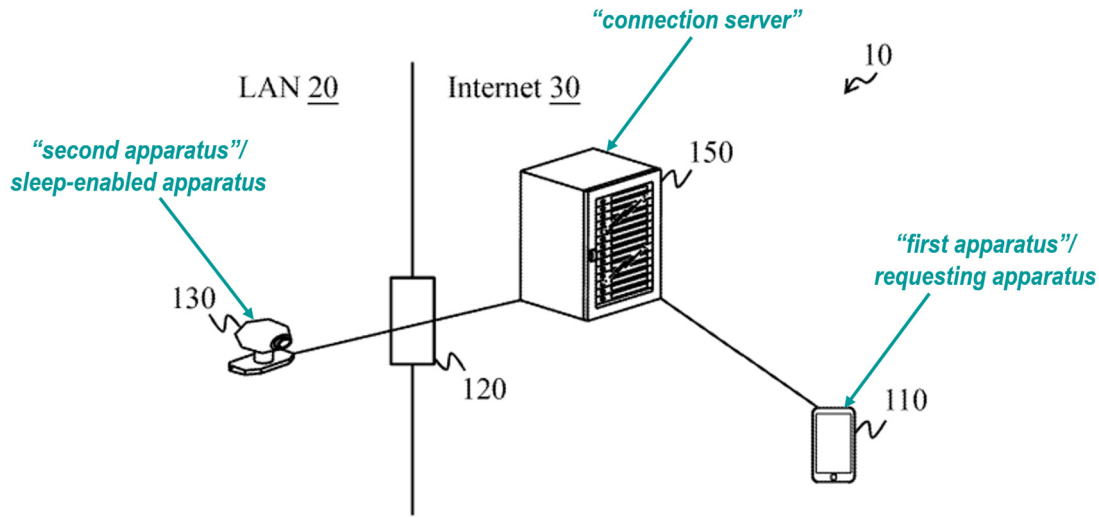


FIG. 1A

EX1001, Figure 1A (annotated), 3:19-33. The connection server 150 is configured to facilitate remotely waking up the sleep-enabled apparatus. EX1001, 5:11-15. Figure 5 illustrates a method for remotely waking up the sleep-enabled apparatus 130. EX1001, Figure 5. First, the connection server 150 receives a wakeup request packet from the requesting apparatus 110 that includes a device identifier (ID) of the sleep-enabled apparatus 130. EX1001, 5:21-26. Next, the connection server 150 uses the ID of the sleep-enabled apparatus 130 to retrieve wakeup information and a network address of the sleep-enabled apparatus 130 from a storage unit of the server. EX1001, 5:34-37, 6:1-4, 6:34-40. Next, the connection server 150 generates an apparatus wakeup packet that includes the ID of the sleep-enabled apparatus 130 and the wakeup information. EX1001, 5:37-40, 5:41-48 Figure 7. Once generated the server sends the apparatus wakeup packet to the sleep-enabled apparatus 130. EX1001, 5:37-40, 5:41-48 Figure 7. The network module of sleep-enabled apparatus

130 obtains wakeup feature data from the apparatus wakeup packet to compare the wakeup feature data to pre-stored feature data. EX1001, 7:29-37. Finally, a result of the comparison determines whether to wake up the [sleep-enabled] apparatus or ignore the apparatus wakeup request. EX1001, 6:48-53, 7:29-41.

B. File History of the '448 Patent

32. As part of my preparation of this declaration, I reviewed the file history of the '448 Patent (EX1002). I understand that the '448 Patent was filed August 24, 2017, with 25 claims. See EX1002, 247-248.

33. The U.S. Patent Office issued two office actions and an advisory action, which included prior art rejections based upon patent literature not raised in this declaration. See EX1002, 69-93, 127-144, . The first Office Action asserted that the independent claims were anticipated or rendered obvious based on prior art including Winter (EX1010). See EX1002, 127-144. The applicant attempted to distinguish from Winter arguing that “Winter fails to suggest the limitations of ‘obtaining a network address corresponding to the second apparatus 150 according to the wakeup request packet’ and ‘sending the apparatus wakeup packet to the second apparatus based on the network address.’” EX1002, 110-120. However, the Final Office Action issued in response asserted that the claims were obvious based on prior art that again included Winter (EX1010). EX1002, 69-93.

34. Next, the applicant responded making various amendments to the claims. EX1002, 47-61. The Office issued an advisory action in response indicating that, in view of the new limitations, further search and consideration were required. EX1002, 44-46. In response to which the applicant filed an RCE. EX1002, 36-37. The Examiner initiated an interview in which the parties agreed to proposed claim amendments for entry by Examiner Amendment. EX1002, 15. The applicant never submitted an IDS to cite the known and pertinent remote wakeup methods for a network apparatus.

35. A Notice of Allowance followed on January 28, 2020. EX1002, 7-14. The Notice of Allowance alleged that the prior art failed to teach “a segment of data within a packet that determines whether the apparatus is awakened.” EX1002, 12.

C. Interpretation of the '448 Patent Claims at Issue

36. For purposes of my analysis in this IPR proceeding, I understand that the terms that appear in the claims of the '448 Patent should be interpreted according to their ordinary and customary meaning under the Phillips standard. In determining the ordinary and customary meaning, I understand that the words of a claim are first given their plain meaning that those words would have had to a POSITA at the time of the alleged invention. I also understand that the structure of the claims, the specification and file history also may be used to better construe a claim insofar as the plain meaning of the claims cannot be understood. Moreover, I understand that

even treatises and dictionaries may be used, albeit under limited circumstances, to determine the meaning attributed by a POSITA to a claim term at the time of filing. I have followed this approach in interpreting terms of the Challenged Claims herein.

37. I also understand that the words of the claims should be interpreted as they would have been interpreted by a POSITA at the time the invention was made (not today). For purposes of my analysis here, I have interpreted terms of the Challenged Claims from the perspective of a POSITA as of the asserted August 29, 2016 priority date of the '448 Patent.

38. I further understand that elements in a claim of a patent can be expressed as a means or step for performing a specified function without recital of the underlying structure for performing that function. When a claim element is expressed in this manner, the claim element is construed to cover only the corresponding structure described in the specification of the patent for performing the function recited in the claim element, or equivalents of the structure described in the specification. I also understand that a claim element expressed as a means or step for performing a function that can be implemented in software can be construed to cover only the corresponding algorithms described in the specification of the patent for performing the function, or equivalents of the algorithms described in the specification.

VII. OVERVIEW OF THE CITED REFERENCES

A. Zhang (EX1004)

39. Zhang is directed to systems and methods for “remotely waking a sleeping computer system.” EX1004 (Zhang), [0036]. Figure 3 illustrates “a method for securely waking a computer system over a network”:

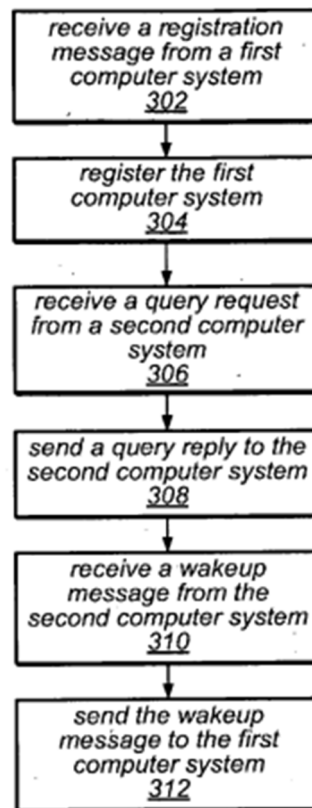


FIG. 3

EX1004 (Zhang), Figure 3, [0049].

40. This method starts with the server’s receiving a registration message from the sleep-enabled computer system. EX1004 (Zhang), [0053]; Figure 3, step

302; *see above* at ¶30. The registration message can include “information identifying the [sleep-enabled] computer system” including a “user-selected human-readable identification information for the [sleep-enabled] computer system,” “an IP address of the [sleep-enabled] computer,” and a “nonce.” EX1004 (Zhang), [0054-0055]. The information in the registration message is stored at the server. EX1004 (Zhang), [0056]; Figure 3, step 304.

41. Next, the server receives a query request including “the user-selected human-readable ID of the [sleep-enabled] computer” from the requesting computer system. EX1004 (Zhang), [0059-0060]; Figure 3, step 306. In response to receiving the query request, the server sends a query reply to the requesting user computer system. EX1004 (Zhang), [0061]; Figure 3, step 308. The query reply “may include some or all of the information received by the server from the [sleep-enabled] computer system in the registration message.” EX1004 (Zhang), [0061]. Accordingly, the query reply can include “the user-selected human-readable ID of the [sleep-enabled] computer,” “IP address,” and “nonce.” EX1004 (Zhang), [0054-0055], [0061]. Next, the requesting computer system initiates a wakeup message using the information received in the query reply. EX1004 (Zhang), [0062-0066]. The wakeup message is sent to the server which modifies the wakeup message before sending the modified wakeup message to the sleep-enabled computer system. EX1004 (Zhang), [0066], [0070]-[0071], [0079]-[0081]; Figure 3, steps 310, 312.

42. Finally, the sleep-enabled computer system compares the nonce in the message to the original nonce and, in some examples, other authentication information). EX1004 (Zhang), [0067-0068]. If the nonce in the wakeup message is the same as the original nonce the network interface controller wakes up the sleep-enabled computer system. EX1004 (Zhang), [0068].

B. Zill (EX1005)

43. Zill is also directed to systems and methods to remotely waking up a computer system. EX1005 (Zill), [0015-0016]. Figure 6, for example, illustrates a “communication process 600 for remote wake up of a target host”:

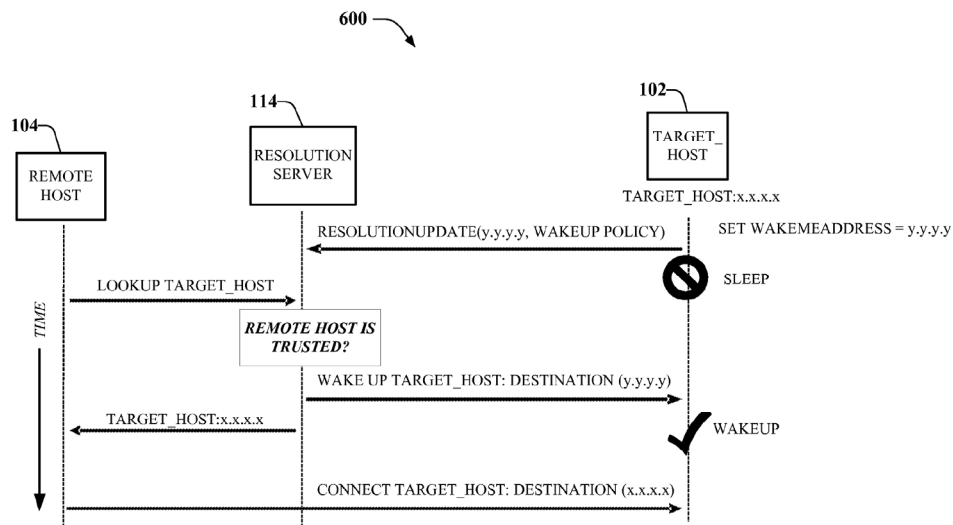


FIG. 6

EX1005 (Zill), Figure 6, [0106]. First, the target host communicates a “wakemeaddress” and a “resolution policy” to the “resolution server 114.” EX1005

(Zill), [0108]. Next, the “resolution server 114 can facilitate remotely waking target host 102” in response to “a name resolution request.” EX1005 (Zill), [0109]. When the resolution server receives a “name resolution request from an authorized host” (e.g., (“remote host 104”), the resolution server sends “a packet to target host 102 via the wakemeaddress associated with the target host 102” to wake up the “target host 102” and “a regular address associated with target host” to the “remote host 104” to allow “the remote host 104” to communicate with the “target host 102.” EX1005 (Zill), [0109-110]. Zill goes on to explain that this method advantageously allows the “resolution server” to facilitate “remote wake up of target host for all legacy remote hosts.” EX1005 (Zill), [0111].

C. Priority Date of Liu (EX1006)

44. Liu (EX1006) claims the benefit of Chinese Patent Application No. 201610422371.8 (“the ’371.8 Application”; EX1009) (certified translation filed as EX1008), which was filed June 15, 2016 —i.e., more than two months before the Critical Date of the ’448 patent. The ’371.8 Application provides clear and unambiguous support for at least independent claim 1 of Liu. The following table identifies exemplary support in the ’371.8 Application for each limitation of Liu’s claim 1.

<u>Liu (EX1006) (Claim 1)</u>	<u>Exemplary Support in Translation of Liu Priority Application (EX1008)</u>
-------------------------------	--

An Internet Protocol (IP) camera control method, comprising:	EX1008, Title, [0001], [0005-0006], [0013], [0026], [0043], [0059], [0093], Figures 2, 4, 5, 7, claim 1
receiving, by an IP camera, a standby instruction from a server;	EX1008, [0054], Figures 2, 4, 7 (S202), claim 1.
switching, by the IP camera, from a working state to a standby state, wherein the IP camera and the client are connected to the server respectively;	EX1008, [0051], [0055-0058], Figures 2, 4, 7 (S203), claim 1
constructing, by the IP camera, a heartbeat packet;	EX1008, [0069], [0073], [0081] Figures 4, 7 (S2034), claim 2
sending, by the IP camera, the heartbeat packet to the server at a first preset frequency to make the IP camera maintain a heartbeat connection to the server.	EX1008, [0078-0081], Figures 4, 7 (S2034) (S205), claim 2.

45. Even beyond the above-identified support in the '371.8 Application for Liu's claims, the evidence confirms that Liu's teachings cited herein against the '448 patent were similarly taught in the '371.8 Application. *Infra*, Analysis of Ground 3 below (citing to Liu (EX1006) and then corresponding portions of '371.8 Application—Certified Translation (EX1008)).

D. Liu (EX1006)

46. Liu is also directed to methods for remotely waking up “an IP camera.”

EX1006 (Liu), [0094]; EX1008, [0093]. Figure 7 illustrates “a signaling interaction diagram of an IP camera control method” for waking up “an IP camera:

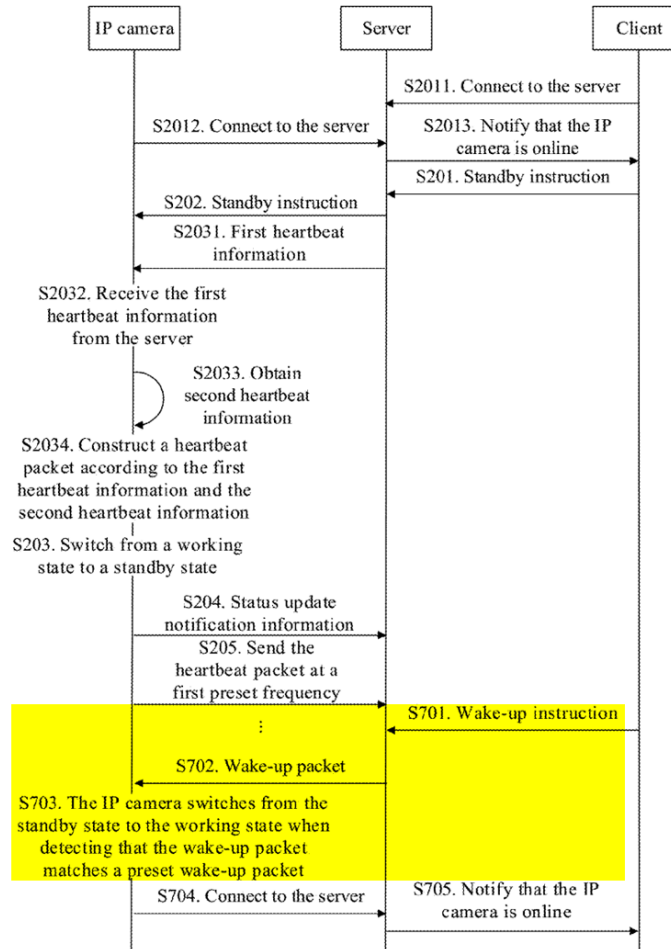


FIG. 7

EX1006 (Liu), Figure 7 (highlighted) (steps S701-S703), [0094-0102]; EX1008, Figure 7, [0093-0101]. As shown in the highlighted portion above, the server receives “a wake-up instruction” that “includes the port number and the

communication address of the IP camera to be woken up.” EX1006 (Liu), [0095-0097], Figure 7 (step S701); EX1008, [0094-0096], Figure 7. Next, the server sends “a wake-up packet to the IP camera” where “[t]he wake-up packet is pre-agreed between the server and the IP camera.” EX1006 (Liu), [0098-0100], Figure. 7 (step S702); EX1008, [0097-0099], Figure 7. In response, “[t]he IP camera switches from the standby state to the working state when [the IP camera] detect[s] that the wake-up packet from the server matches a preset wake-up packet.” EX1006 (Liu), [0098-0102], Figure 7 (step S703); EX1008, [0097-0101], Figure 7.

VIII. GROUND 1A: ZHANG ANTICIPATES CLAIMS 1, 7-8, 10-11, 15-16, 18-19, AND 23-25

A. Claim 1

Element [1pre] A remote wakeup method, comprising:

47. Zhang discloses Element [1pre]. Zhang discloses a “**method** for **remotely waking** a sleeping computer system.” EX1004 (Zhang), [0036] (emphasis added), *see also* Figure 3, Title, Abstract, [0049-0071].

Element [1a] a connection server receiving a wakeup request packet from a [requesting] apparatus,

48. Zhang discloses Element [1a]. Zhang describes “a query **request** may be received by the **server**.” EX1004 (Zhang), [0059], *see also* [0049-0067] (describing a “**server** computing system”), [0073-0078] (describing a “**server** 404”). “The query **request** may be sent by the **[requesting] computer system**.” EX1004

(Zhang), [0059], *see also* [0016], [0075], Figure 4. Zhang explains that “the query *request* may be initiated by a user ... of the *[requesting] computer system*, as a first step towards *waking* the [sleep-enabled] computer system over the network.” EX1004 (Zhang), [0059-0060]. Therefore, because it initiates the wakeup process, Zhang’s “query request” discloses the claimed “wakeup request packet.”

49. Additionally, A POSITA would have recognized that Zhang’s “query request” is a type of message sent from the requesting computer to the server, and further would have recognized that such messages that are transmitted are provided by one or more data packets.

50. I note that Figure 4 in Zhang depicts an “end user computer system 406.” EX1004 (Zhang), Figure 4. Throughout the application Zhang refers to the end user computer system as the second computer system. *See, e.g.*, EX1004 (Zhang), [0049] (“an end user computer system (referred to herein as the second computer system)”). Accordingly, the end user computer system 406 and the second computer system refer to the same computer system in Zhang. As I discussed above in ¶30, I will refer to this computer system as the “requesting” computer system in this declaration.

Element [1a.i] wherein the wakeup request packet comprises a device identifier of a [sleep-enabled] apparatus,

51. Zhang discloses Element [1a.i]. For example, Zhang discloses that the “query request [*i.e.*, the claimed “wakeup request packet”] may include

identification information for the [sleep-enabled] computer system.” EX1004 (Zhang), [0059], *see also* [0016], [0075-0076] (explaining that the “query request may simply include the encoded ID” of the sleep-enabled computer system), Figure 4. In one example, Zhang discloses that the query request may include a “user-selected human-readable *ID of the [sleep-enabled] computer.*” EX1004 (Zhang), [0059]. An “ID ... of the computer” is a “device identifier.”

Element [1a.ii] wherein the [requesting] apparatus is connected to the connection server via local area network or internet;

52. Zhang discloses Element [1a.ii]. As I discussed above in Section VIII.A, Element [1a], the *server* receives a query request from *the requesting computer system*. Zhang explains that the *requesting computer system* is *connected to the server via* “a wide-area network (WAN), such as the *internet.*” EX1004 (Zhang), [0073], [0038], Figure 4, *see also* [0009], [0075-0077], Figure 3. The connection between the requesting computer system and the server allows the *requesting computer system* to communicate with the *server* to send messages including the “query request.” EX1004 (Zhang), Figure 4, [0059], [0075-0077].

Element [1b] the connection server obtaining wakeup information stored in the connection server according to the wakeup request packet,

53. Zhang discloses Element [1b]. For example, Zhang discloses the server, in response to receiving the query request (e.g., *the wakeup request packet*), the

sending “a query reply” to the requesting computer. EX1004 (Zhang), [0061], Figure 3, step 312. The “query reply” includes “information needed by the [requesting] computer system in order to generate and send a wakeup message to the [sleep-enabled] computer system.” EX1004 (Zhang), [0061], Figure 3, step 312.

54. First, Zhang’s sleep-enabled computer system goes through an initial “registration” process in which the sleep-enabled computer sends information to the server. *See, e.g.*, EX1004 (Zhang), [0053]-[0056] and Figure 3, step 302. The server stores this information in an associated memory, and then retrieves at least part of it as needed to facilitate the wakeup process. *See, e.g.*, EX1004 (Zhang), [0053]-[0056] and Figure 3, step 302. This information includes “information received by the server from the [sleep-enabled] computer system in the registration message.” EX1004 (Zhang), [0061]. Zhang provides specific examples of such registration information including “a nonce.” EX1004 (Zhang), [0061], *see also* [0015], [0055], [0058], [0074]. Zhang discloses that registering the sleep-enabled computer system at the server includes “**storing** some or all of the information included in the registration message from the [sleep-enabled] computer system [(such as the “nonce”/**wakeup information**)] in a memory.” EX1004 (Zhang), [0056], Claims 7, 15. In other words, this information is stored in a memory 204 of the server. EX1004 (Zhang), [0043], [0045], *see also* [0056], Claims 7, 15; Figure 2, element 204.

55. Accordingly, the server *obtains wakeup information*, such as a nonce and an encryption method, *stored in the server according to* the query request (the claimed “*wakeup request packet*”) in order to send the described query reply to the requesting computer. EX1004 (Zhang), [0061], *see also* [0060] (“responding to the query request”), *see also* [0064], [0076-0077]; Claims 7, 15.

56. I also note notes that the claims of the ’448 patent do not define the content/scope of the “wakeup information.” The specification is also unhelpful. For example, the specification provides an example in which the server and the sleep-enabled device “both have the wakeup information WM with the same content” without expressing boundaries for such “content.” EX1001, 9:29-31. In one section the specification notes that the wakeup information can include “an authorization key” in “some embodiments.” EX1001, 9:42-43 (noting).

Element [1b.i] wherein the wakeup information stored in the connection server is the same as wakeup information stored in the [sleep-enabled] apparatus;

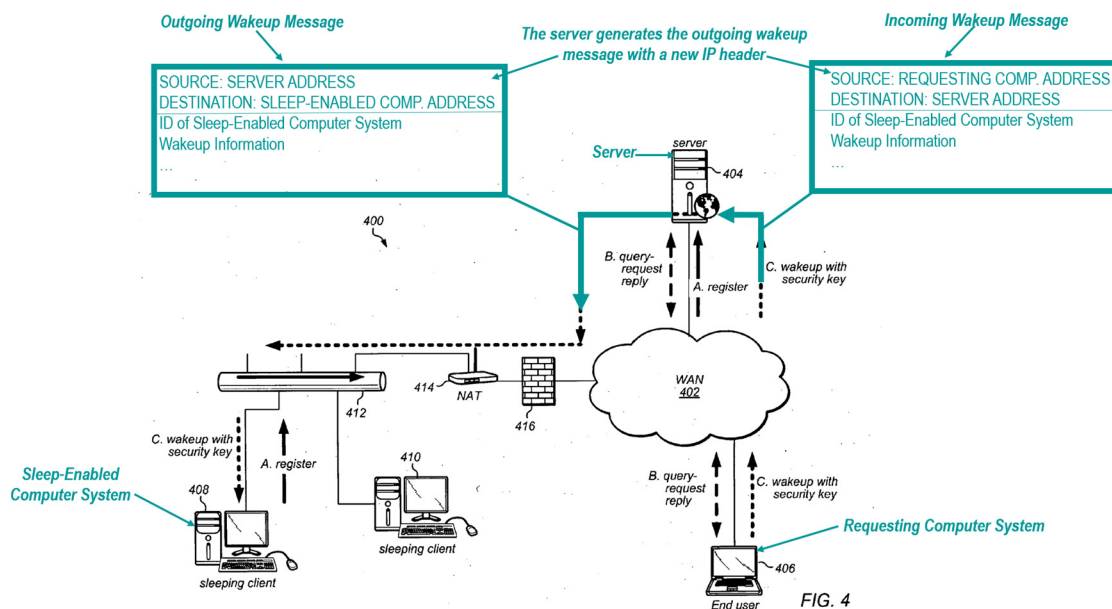
57. Zhang discloses Element [1b.i]. As I described above in Section VIII.A., Element [1b], *the wakeup information* includes “a nonce” that is stored at the *server* based on registration message sent from the *sleep-enabled computer system*. *See also* EX1004 (Zhang), [0061], *see also* [0015], [0055], [0058], [0074]. Zhang discloses that the “nonce” can be “a random or pseudorandom number, such as a random octet.” EX1004 (Zhang), [0055]. Zhang also discloses that, as part of the

wakeup process, the *sleep-enabled computer system* compares the nonce in a received wakeup message (e.g., corresponding with *the nonce stored at the server*) with an original nonce (the nonce generated at the [sleep-enabled] apparatus) and “[i]f the comparison indicates that they are the same, the wakeup message may be authenticated.” EX1004 (Zhang), [0068], *see also* [0078]. Accordingly, Zhang discloses both the *server* and *the [sleep-enabled] apparatus* as storing the same *wakeup information* in the form of a nonce. EX1004 (Zhang), [0055], [0061], [0068]. In other words, the same random or pseudorandom number (nonce) is stored both at the server and the sleep-enabled computer system. EX1004 (Zhang), [0055], [0061], [0068].

Element [1c] the connection server generating an apparatus wakeup packet according to the wakeup request packet and the wakeup information,

58. Zhang discloses Element [1c]. For example, Zhang describes a modified “wakeup message,” as the claimed *apparatus wakeup packet*, which “may be sent to the [sleep-enabled] computer system by the server.” EX1004 (Zhang), [0066]. For example, Zhang discloses the requesting computer system as generating an incoming “wakeup message” using “the nonce” received by the requesting computer system in the “query reply” sent by the server (e.g., based on the query request (*wakeup request packet*)). EX1004 (Zhang), [0062-0064]. In this declaration I use “incoming” and “outgoing” wakeup messages from the perspective

of the server. The requesting computer system sends the incoming wakeup message to the server which “may modify or authenticate the wakeup message before sending the [outgoing] wakeup message to the [sleep-enabled] computer system.” EX1004 (Zhang), [0066], *See also* Figure 4:



EX1004 (Zhang), Figure 4 (annotated).), [0066], [0070]-[0071], [0079]-[0081]. Based on my review this modified, outgoing wakeup message (the apparatus wakeup packet) is generated by the server, as confirmed by the evidence herein for at least the following reasons.

59. As a first reason, Zhang expressly discloses that the server “may modify or authenticate the wakeup message before sending the wakeup message to the [sleep-enabled] computer system.” EX1004 (Zhang), [0066]. For example, at a minimum, Zhang teaches that the server “modif[ies]” the incoming wakeup message

by adding the IP address of the sleep-enabled computer, which is stored internally at the server, but which was not included in the incoming wakeup message (which instead includes the “human-readable ID” of the sleep-enabled computer in some embodiments). *Infra* [1d], EX1004, [0063] (“may include the user-selected human-readable ID”), [0018], [0054], [0056]. The server’s modifying of the incoming message wakeup message results in the generation of a new outgoing wakeup message (the claimed apparatus wakeup packet) because the outgoing wakeup message includes information not present in the incoming wakeup message. The outgoing wakeup message outgoing wakeup message (the claimed ***apparatus wakeup packet***) must also include one or more items of registration information retrieved from the server’s memory. For example, the outgoing wakeup message must include the IP address for the sleep enabled computer system which, as discussed, is not included in the incoming message because the IP address for the sleep enabled computer system is needed to properly address the message from the server to the sleeping client.

60. As a second reason, regardless of whether Zhang’s server “modif[ies]” the incoming wakeup message as described in paragraph [0066] or the server “forwards” the incoming wakeup message as described in paragraph [0078]), every message sent from a server to a computer system over the internet includes one or more IP packets that must be generated at the server. Specifically, Zhang’s server

(including the message sent when the server “forwards” the incoming wakeup message as described in paragraph [0078]), is disclosed as being sent via one or more IP packets that are generated at the server to include the appropriate IP headers so that the message will be delivered to the correct destination. EX1004 (Zhang), [0080-0082]; Figure 5. Figure 5, for example, shows an “exemplary message format”:

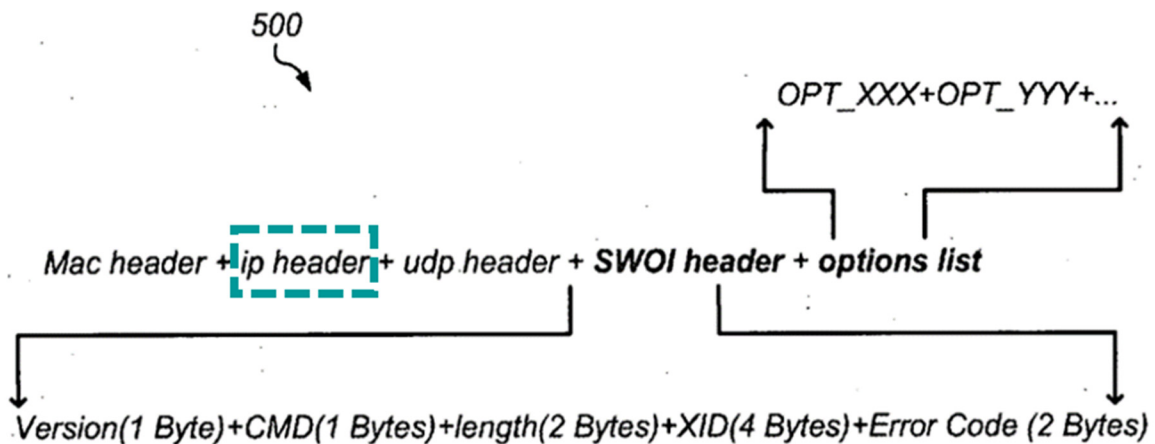


FIG. 5

EX1004 (Zhang), Figure 5 (annotated), [0079-0082]. The IP headers must include a source address header (e.g., associated with the device sending the packet) and the destination address header (e.g., associated with the device receiving the packet) to send an IP packet from the server to the sleep-enabled computer system must be different from the source and destination headers used to deliver an IP packet from the requesting computer system to the server. EX1004 (Zhang), Figure 5 (“ip

header”), [0079-0082]; *see also* EX1017, 11 (illustrating an example IP header format). Therefore, the server generates at least one new outgoing packet to send the outgoing wakeup message to the sleep-enabled computer system. EX1004 (Zhang), Figure 5, [0079-0082]. For example, where the sleep-enabled computer is the “destination” of such outgoing packet, and the server is the “source.” The generation of the at least one outgoing packet to send the outgoing wakeup message to the sleep-enabled computer system is different from the incoming packets with the incoming wakeup message. The at least one outgoing packet to send the outgoing wakeup message also qualifies as the claimed “*apparatus wakeup packet*.” From the server.

61. The outgoing wakeup message is therefore generated according to the incoming wakeup message, which in turn is generated using information obtained in a query reply according to the query request (*the wakeup request packet*) including the nonce (the *wakeup information*). *See above* Section VIII.A, Element [1b]; EX1004 (Zhang), [0061] (explaining that “the query reply may include some or all of the information received by the server from the [sleep-enabled] computer system in the registration message”), [0015] (explaining that the registration information may include “user-selected human-readable identification information for the [sleep-enabled] computer system” and “a nonce”); [0064] (describing the use of the information in the query reply to generate the incoming wakeup message), [0066].

62. Finally, Zhang’s apparatus wakeup packet is generated by the server “*according to*” the above-described wakeup request packet and the wake wakeup information because it uses both (i) information supplied by the query request (wakeup request packet), and (ii) the nonce (wakeup information), which is retrieved by the server from its memory. Zhang thus discloses that the server generates the *apparatus wakeup packet* according to the query request (the claimed *wakeup request packet*) and the nonce (the claimed *wakeup information*).

Element [1c.i] wherein the apparatus wakeup packet comprises the device identifier of the [sleep-enabled] apparatus from the wakeup request packet and the obtained wakeup information;

63. Zhang discloses Element [1c.i]. For example, Zhang’s outgoing wakeup message (*the apparatus wakeup packet*), as I discussed above in Section VIII.A Element [1c], can include information from the incoming wakeup message. Zhang explains that the incoming “wakeup message” is generated using “information received in the query reply” and that the query reply can include the “nonce” and the “user-selected human-readable ID.” EX1004 (Zhang), [0061] (“if the query reply includes the aforementioned nonce, the [requesting] computer system may use the encryption algorithm to encrypt the nonce, and include the encrypted nonce in the wakeup message.”), [0017], [0064], [0076-0077]; *above* Section VIII.A, Element [1c]. Therefore, Zhang discloses the outgoing wakeup message (*the apparatus wakeup packet*) includes this information from the

incoming wakeup message—the “user-selected human-readable ID of the [sleep-enabled] computer” (*the identifier of the sleep-enabled apparatus*) from the “query request” (*the wakeup request packet*) and the “nonce” (the *obtained wakeup information*). See e.g., EX1004 (Zhang), [0081] (describing “possible options” to include in a message including “a user-selected ID” and “a nonce”), see also [0017], [0064], [0076-0077].

Element [1d] the connection server obtaining a network address corresponding to the [sleep-enabled] apparatus from a storage unit of the connection server according to the wakeup request packet;

64. Zhang discloses Element [1d]. First, Zhang discloses the [sleep-enabled] computer system sending a registration message to the server that includes “an IP address of the [sleep-enabled] computer system” (the claimed “network address”). EX1004 (Zhang), [0054], [0056]. Zhang discloses that the sleep-enabled computer system was registered at the server by “**storing** some or all of the information included in the registration message from the [sleep-enabled] computer system [(such as the **IP address**)] in a memory.” EX1004 (Zhang), [0056], see also [0031], [0042-0043]. Zhang’s “memory” is the claimed *storage unit of the server*. See EX1004 (Zhang), [0031], [0042-0043], [0074]. Zhang also explains that “the query reply,” sent in response to the query request (*the wakeup request packet*) “may include some or all of the information received by the server from the [sleep-enabled] computer system in the registration message.” EX1004 (Zhang), [0061].

65. Accordingly, Zhang discloses that the query reply can include the IP address of the sleep-enabled computer system. EX1004 (Zhang), [0054], [0056], [0061]. The server must be able to obtain the IP address from the storage unit of the server in order for the server to be able to send the IP address of the sleep-enabled computer system in a query reply. Similar to as I explained above, the claimed language “*according to*” includes *using* the query reply to obtain the IP address. *Additionally, the IP address* is obtained for the query reply *according to* the corresponding query request (*the wakeup request packet*).

Element [1e] the connection server sending the apparatus wakeup packet to the [sleep-enabled] apparatus based on the network address,

66. Zhang discloses Element [1e]. As I discussed above in Section VIII.A Element [1c], Zhang discloses the server generating an outgoing wakeup message, which corresponds to the claimed *apparatus wakeup packet*. Zhang also discloses *the network address* as I discussed in element Section VIII.A [1d]. Sending the *apparatus wakeup packet* from the server to the correct sleep-enabled computer system would necessarily be based on the network address. Specifically, the server must use the IP address of the sleep-enabled computer system in order to send the *apparatus wakeup packet* to the sleep-enabled computer system.

Element [1e.i] wherein wakeup feature data is a segment of data of the apparatus wakeup packet and is for determining whether the entire [sleep-enabled] apparatus be awoken.

67. Zhang discloses Element [1e.i]. As I discussed above in Section VIII.A, elements [1c], [1c.i], *the apparatus wakeup packet* includes a nonce (*the wakeup information*). Therefore, the nonce is a *segment of data of the apparatus wakeup packet* and qualifies as the claimed *wakeup feature data*. Zhang describes comparing the nonce received in the apparatus wakeup packet to “an original nonce,” and “[i]f the comparison indicates that they are the same, the wakeup message may be authenticated and the NIC may *wake up the [sleep-enabled] computer system.*” EX1004 (Zhang), [0068], *see also* [0078].

68. Zhang’s describes the waking up process for the sleep-enabled computer system as including “returning the computer system to a fully-on state” (i.e., includes having the entire computer system be awoken). EX1004 (Zhang), [0034], *see also* [0067] (disclosing “[a]fter waking, the [sleep-enabled] computer system may be in a fully-on state[.]”). Therefore, the nonce (the claimed *wakeup feature data*) is used *for determining whether the entire [sleep-enabled] apparatus be awoken*. See EX1004 (Zhang), [0034], [0067-0068].

B. Claim 7

Element [7] The remote wakeup method according to claim 1, further comprising: receiving a sleep login packet from the [sleep-enabled] apparatus; and recording a running state of the [sleep-enabled] apparatus as a sleep state in the storage unit according to the sleep login packet.

69. Zhang discloses Element [7]. For example, Zhang’s registration message as the claimed ***sleep login packet***. Zhang explains that “the NIC of the [sleep-enabled] computer system and the server may maintain an active connection for a pre-determined period of time after the [sleep-enabled] computer system sends the registration message to the server.” EX1004 (Zhang), [0057]. “[T]he server may initiate a timeout timer of a pre-determined length upon receiving the registration message.” EX1004 (Zhang), [0057]. Zhang also explains that “the [sleep-enabled] computer system to periodically send a new registration message to the server, in order to maintain the active connection with the server and thereby maintain the capability to receive a wakeup message over the network, ***as long as the [sleep-enabled] computer system remains in a sleep mode.***” EX1004 (Zhang), [0057]. Therefore, Zhang discloses the server as receiving the registration message (the claimed ***sleep login packet***) and recording a running state of the sleep-enabled computer system (e.g., that the sleep-enabled computer system is in the sleep-mode while at least as long as the “timeout timer” is active) according to the registration message. EX1004 (Zhang), [0057-0058].

C. Claim 8

Element [8] The remote wakeup method according to claim 7, wherein the sleep login packet has a feature flag, and the feature flag indicates that the running state of the [sleep-enabled] apparatus is the sleep state.

70. Zhang discloses Element [8]. As I discussed above in Section VIII.B, Element [7], Zhang discloses the claimed *sleep login packet* with Zhang's registration message. Zhang explains that the disclosed messages includes a "CMD field" that "indicate[s] a type of [secure wake over internet] message, such as a registration message." EX1005 (Zill), [0080]. The CMD field in the registration message therefore qualifies as the claimed *feature flag* which indicates that the running state of the sleep-enabled computer system is the sleep state because the registration message is received at the server while "the [sleep-enabled] computer system remains in a sleep mode." EX1004 (Zhang), [0057-0058], [0080].

D. Claim 10

Element [10] The remote wakeup method according to claim 1, wherein the steps of obtaining the wakeup information and the network address comprise: reading the wakeup information and the network address that correspond to the device identifier from a storage unit.

71. Zhang discloses Element [10]. As I discussed in Section VIII.A, Elements [1b] and [1d], Zhang discloses that the sleep-enabled computer system is registered at Zhang's server by "**storing** some or all of the information included in the registration message from the [sleep-enabled] computer system in a memory."

EX1004 (Zhang), [0056]. Zhang also explains that the registration message can include the “IP address of the [sleep-enabled] computer,” “user-selected human-readable identification,” and the “nonce.” EX1004 (Zhang), [0054-0055]. Zhang discloses that the server includes a “memory medium” (*see* EX1004 (Zhang), [0042-0043], Figure 2) which is defined as including “[a]ny of various types of memory devices or storage devices.” EX1004 (Zhang), [0031]. Accordingly, Zhang discloses that the “IP address of the [sleep-enabled] computer” (the claimed “network address”), the “user-selected human-readable identification information” (the claimed “device identifier”), and the “nonce” (the claimed “wakeup information”) are stored at a storage device of the server. EX1004 (Zhang), [0031], [0042-0043], [0054], [0056], Figure 2.

72. Zhang also discloses the claimed *steps of obtaining the wakeup information and the network address comprise: reading the wakeup information and the network address that correspond to the device identifier from a storage unit*. For example, Zhang discloses an embodiment in which the “query request” sent by the requesting computer to the server “include[s] **just** the user-selected human-readable ID [the claimed “device identifier”] of the [sleep-enabled] computer,” meaning that only the device identifier, and nothing else, is transmitted to the server in the query request. EX1004 (Zhang), [0059]. Because Zhang’s server does not receive all required information in the query request, it must retrieve (*i.e.*,

“read”) the nonce (“wakeup information”) and IP address (“network address”) from its storage device using an association between the user-selected human-readable ID of the sleep-enabled computer.

E. Claim 11

Element [11pre] A connection server, comprising:

73. Zhang discloses Element [11pre]. For example, Zhang describes a server for remotely waking up a sleep-enabled computer system. *See* EX1004 (Zhang), [0049-0067] (describing a “**server** computing system”), [0073-0078] (describing a “**server** 404”), *see also* [0042]. *See also* Element [1pre].

Element [11a] a network module;

74. Zhang discloses Element [11a]. Zhang discloses that the “computer system 200,” illustrated in Figure 2, “may be used to implement one or more of computer systems [“sleeping client”] 104, [“end user”] 106 and/or [**server**] 108”), Figure 2. Zhang explains that the “computer system 200” includes a “a network interface controller (NIC) 206” (*i.e.*, the claimed “**network module**”). EX1004 (Zhang), [0043], [0067], [0068], [0074], [0078]. *See also* Element [1a.ii].

Element [11b] a storage unit, which stores a network address and wakeup information that correspond to a [sleep-enabled] apparatus; and

75. Zhang discloses Element [11b]. As discussed in Elements [1b] and [1d], Zhang explains that the sleep-enabled computer system is registered at the server by

“**storing** some or all of the information included in the registration message from the [sleep-enabled] computer system in a memory.” EX1004 (Zhang), [0056], [0074] (“The server may store all of this information,” referring to the registration information received from a sleep-enabled computer). Zhang goes on to explain that the information provided by the registration message, and stored in the server’s memory, can include the “IP address of the [sleep-enabled] computer” (*the network address*), and the “nonce” (*wakeup information*) for a corresponding sleep-enabled computer system. EX1004 (Zhang), [0054-0056].

76. Zhang explains that the server’s components (e.g., as shown in computer system 200 in Figure 2) include a “memory medium,” which is defined to include “[a]ny of various types of memory devices or *storage devices*.” EX1004 (Zhang), [0031], [0042-0043], Figure 2. Therefore, Zhang discloses that the “IP address of the [sleep-enabled] computer,” and the “nonce” of a corresponding sleep-enabled computer are stored at a storage device of the server. EX1004 (Zhang), [0031], [0042-0043], [0054], [0056], Figure 2.

Element [11c] a control unit, which

77. Zhang discloses Element [11c]. For example, Zhang’s server implemented as the “computer system 200” includes “processor 202,” which is a well-known type of “control unit.” EX1004 (Zhang), [0043], [0051], Figure 2, *see also* [0032], [0044-0045].

Element [11c.i] connects to the network module and storage unit,

78. Zhang discloses Element [11c.i]. For example, Zhang explains that the server can implemented as shown in Figure 2 with the “computer system 200.” EX1004 (Zhang), [0043], Figure 2. The “computer system 200” includes the “processor 202.” EX1004 (Zhang), [0043], Figure 2. The “processor 202 [the claimed “control unit”] ... may be coupled to [the] memory medium 204” [the claimed “storage unit”] and the “network interface controller (NIC) 206 [the claimed “network module].” EX1004 (Zhang), [0043], Figure 2; *Above* Section VIII.E, Elements [11a], [11b], [11c].

Element [11c.ii] receives a wakeup request packet from a [requesting] apparatus through the network module,

79. Zhang discloses Element [11c.ii] for the same reasons as those discussed above in Section VIII.A, Element [1a].

Element [11c.iii] obtains the wakeup information stored in the storage unit and the network address stored in the storage unit according to the wakeup request packet,

80. Zhang discloses Element [11c.iii] for the same reasons as those discussed above in Section VIII.A, Elements [1b], [1d].

Element [11c.iv] generates an apparatus wakeup packet according to the received wakeup request packet and the obtained wakeup information, and

81. Zhang discloses Element [11c.iv] for the same reasons as those discussed above in Section VIII.A, Element [1c].

Element [11c.v] sends the generated apparatus wakeup packet to the [sleep-enabled] apparatus through the network module according to the network address,

82. Zhang discloses Element [11c.v] for the same reasons discussed above in Section VIII.A, Element [1e].

Element [11d] wherein the wakeup request packet comprises a device identifier of the [sleep-enabled] apparatus, and

83. Zhang discloses Element [11d] for the same reasons discussed above in Section VIII.A, Element [1a.i].

Element [11e] the apparatus wakeup packet comprises the device identifier from the wakeup request packet and the obtained wakeup information of the [sleep-enabled] apparatus,

84. Zhang discloses Element [11e] for the same reasons discussed above in Section VIII.A, Element [1c.i].

Element [11f] wherein the wakeup information stored in the connection server is the same as wakeup information stored in the [sleep-enabled] apparatus, and

85. Zhang discloses Element [11f] for the same reasons discussed above in Section VIII.A, Element [1b.i].

Element [11g] wherein wakeup feature data is a segment of data of the apparatus wakeup packet and is for determining whether the entire [sleep-enabled] apparatus be awoken.

86. Zhang discloses Element [11g] for the same reasons discussed above in Section VIII.A, Element [1e.i].

F. Claim 15

Element [15] The connection server according to claim 11, wherein the storage unit further stores a running state of the [sleep-enabled] apparatus, and the control unit receives a sleep login packet from the [sleep-enabled] apparatus through the network module and updates the running state of the [sleep-enabled] apparatus in the storage unit as a sleep state according to the sleep login packet.

87. Zhang discloses Element [15]. For example, Zhang's registration message qualifies as the claimed ***sleep login packet***. Zhang explains that "the NIC of the [sleep-enabled] computer system and the server may maintain an active connection for a pre-determined period of time after the [sleep-enabled] computer system sends the registration message to the server." EX1004 (Zhang), [0057]. The server would necessarily receive the registration message at the control unit from the sleep-enabled computer system through the network module. "[T]he server may initiate a timeout timer of a pre-determined length upon receiving the registration message." EX1004 (Zhang), [0057]. Zhang discloses that "the [sleep-enabled] computer system to periodically send a new registration message to the server, in order to maintain the active connection with the server and thereby maintain the capability to receive a wakeup message over the network, as long as the [sleep-enabled] computer system remains in a sleep mode." EX1004 (Zhang), [0057]. Therefore, Zhang discloses the server as receiving the registration message (the claimed ***sleep login packet***) and storing an updated running state of the sleep-enabled

computer system (e.g., that the sleep-enabled computer system is in the sleep-mode while at least as long as the “timeout timer” is active) in the storage unit of the server. EX1004 (Zhang), [0057-0058].

G. Claim 16

Element [16] The connection server according to claim 15, wherein the sleep login packet has a feature flag, and the feature flag indicates that the running state of the [sleep-enabled] apparatus is the sleep state.

88. Zhang discloses Element [16] for the same reasons discussed above in Section VIII.C, Element [8].

H. Claim 18

Element [18] The connection server according to claim 11, wherein the storage unit records the device identifier and correspondences between the device identifier and the wakeup information and between the network address and the wakeup information.

89. Zhang discloses Element [18]. As I discussed above in Section, VIII.E, Element [11.2], Zhang discloses a storage unit that stores a network address and wakeup information that correspond to a [sleep-enabled] computer system. Zhang also explains that the server stores a “user-selected human-readable identification information for the [sleep-enabled] computer system” at the server. EX1004 (Zhang), [0054-0056]. Zhang explains that the query reply may only include the user-selected human-readable identification information for the [sleep-enabled] computer system.” EX1004 (Zhang), [0059]. The server must necessarily record a correspondence

between “the user-selected human-readable identification information for the [sleep-enabled] computer system” and both of the nonce (*wakeup information*) and the IP address (*network address*). By way of these correspondences the server has recorded a correspondence (such as relationship in a database) between the IP address and the nonce because each item of data would correspond to one another when stored in a database or data structure.

I. Claim 19

Element [19pre] A networking apparatus having a normal running mode and a sleep mode, comprising:

90. Zhang discloses Element [1pre]. For example, Zhang describes a “sleeping client” that has a *sleep mode* and a normal running mode. EX1004 (Zhang), [0040], [0049] [0053], [0066], FIGs. 1, 3; *see also* [0074], [0078], [0034] (explaining that “[n]early every computer system includes” a sleep state and a fully-on state); Figure 4.

91. I note that Zhang refers to the “sleeping client” as “the [requesting] computer system.” EX1004 (Zhang), [0049].

Element [19a] a network module;

92. Zhang discloses Element [19a]. For example, Zhang explains that the computer system 200 illustrated in Figure 2 is representative of the sleeping client (*e.g.*, computer system 104). EX1004 (Zhang), [0047]. The “computer system 200”

includes a “a network interface controller (NIC) 206.” EX1004 (Zhang), [0043], [0050], *see also* [0053], [0057-0058], [0067-0068], [0074], [0078].

Element [19b] a storage unit, which stores a device identifier and wakeup information; and

93. Zhang discloses Element [19b]. For example, Zhang explains that the computer system 200 illustrated in Figure 2 is representative of the sleeping client (e.g., requesting computer system “104”). EX1004 (Zhang), [0047]. Zhang explains that the computer system 200 (representative of the sleeping client) includes a “[m]emory [m]edium” which is defined to include “[a]ny of various types of memory devices or *storage devices*.” EX1004 (Zhang), [0031], [0042-0043], Figure 2.

94. Zhang’s sleeping client sends a registration message that can include the “user-selected human-readable identification information” (*device identifier*), and the “nonce” (*wakeup information*). EX1004 (Zhang), [0054-0055]. Therefore, the “sleeping client” must store the “user-selected human-readable identification information” (*device identifier*) and the “nonce” (*wakeup information*) in the “memory medium,” in order to send the registration message. EX1004 (Zhang), [0031], [0042-0043], [0047], [0054-0055], Figure 2.

Element [19c] a control unit, which

95. Zhang discloses Element [19c]. Zhang explains that the computer system 200 illustrated in Figure 2 is representative of the sleeping client (e.g.,

computer system 104). EX1004 (Zhang), [0047]. The computer system 200 “may include a processor 202,” also known as a “controller.” EX1004 (Zhang), [0043], Figure 2 *see also* [0053].

Element [19c.i] connects to the network module and storage unit, and

96. Zhang discloses Element [19c.i]. For example, Zhang discloses that the “processor 202 [the claimed “controller”] ... may be coupled to a memory medium 204” and to the “network interface controller (NIC) 206.” EX1004 (Zhang), [0043], Figure 2, *see also* [0053].

Element [19c.ii] before entering the sleep mode, generates a pre-stored feature data according to the device identifier and the wakeup information and stores the pre-stored feature data in the storage unit,

97. Zhang discloses Element [19c.ii]. For example, Zhang’s sleeping client is described as generating “a pre-configured encrypted nonce” and “an encoded ID,” which together make up the pre-stored feature data. EX1004 (Zhang), [0068], [0074]. In some examples, Zhang discloses “a pre-configured encrypted nonce” that is “generated by the [sleeping client] based on the encryption algorithm.” EX1004 (Zhang), [0068]. Zhang’s “pre-configured encrypted nonce” (***the pre-stored feature data***) is generated according to the “nonce” (***the wakeup information***) by applying an encryption algorithm to the nonce. EX1004 (Zhang), [0068]. Additionally, Zhang’s sleeping client sends an “encoded ID ... which may be user-selected, e.g.,

prior to the sleeping client 408 entering the sleep mode.” EX1004 (Zhang), [0074].

Zhang’s encoded ID includes an identifier that is encoded at the sleeping client *according to* the user-selected ID in order to encode the user-selected ID. EX1004 (Zhang), [0074].

98. Zhang’s “pre-configured encrypted nonce” must necessarily be stored in the sleep-client’s storage unit because it is compared with a received “encrypted nonce” as part of the wakeup process. EX1004 (Zhang), [0068]. Additionally, both the “pre-configured encrypted nonce” and the “encoded ID” must be stored at the sleeping client in order to generate a registration message having this information. As discussed, Zhang expressly discloses generating the “encoded ID” *“prior to the sleeping client 408 entering the sleep mode,”* and the “pre-configured encrypted nonce” also is generated prior to the sleeping client entering the sleep mode. EX1004 (Zhang), [0074], *see also* [0054]. Zhang goes on to explain that the “registration message *may* be sent...while the [sleep-enabled] computer system is sleeping.” EX1004 (Zhang), [0053]. Therefore, Zhang implicitly discloses the registration message being sent prior to the [sleep-enabled] computer system entering the sleep mode, and therefore, the “an encrypted nonce” and “an encoded ID” are generated and stored prior to the [sleep-enabled] computer system entering the sleep mode.

Element [19d] wherein the pre-stored feature data comprises entire data or partial data of the device identifier and the wakeup information,

99. Zhang discloses Element [19d]. As I discussed above in Section VIII.I, Element [19c.ii], Zhang describes “a pre-configured encrypted nonce” and “an encoded ID,” which together make up the claimed “pre-stored feature data.” Accordingly, Zhang’s pre-stored feature data comprises “entire data” of “the user-selected human-readable identification information” (***device identifier***) and the “nonce” (***wakeup information***). *See above* Element [19c.ii]; *see also* EX1004 (Zhang), [0068] (explaining that the encrypted nonce is generated by encrypting the nonce), [0074] (explaining that the encoded ID is generated with a user selected ID).

100. I understand that Zhang meets this limitation by disclosing one or the other of those two mutually exclusive alternatives, in this instance the “entire data” of “the user-selected human-readable identification information” (***device identifier***) because the claim language in element [19d] uses the disjunctive conjunction “or” between “entire data” and “partial data.”

Element [19e] wherein: in the normal running mode, the control unit sends a normal login packet through the network module, to provide a network address of the networking apparatus;

101. Zhang discloses Element [19e]. For example, Zhang’s registration message qualifies as the claimed “***normal login packet***” because it provides the server information necessary for connecting to the sleeping client, specifically, “an

IP address of the [sleep-enabled] computer system” (the claimed “*network address of the networking apparatus*”). EX1004 (Zhang), [0054] - [0056].

102. More specifically, Zhang discloses that the registration message may include “an IP address” in order to provide the sleep-enabled computer’s IP address to the server. EX1004 (Zhang), [0054]. Zhang also discloses that the “network interface controller (NIC) 206 coupled to processor 202. NIC 206 may enable the computer system 200 to communicate over a network.” EX1004 (Zhang), [0043]. Accordingly, Zhang discloses sending the registration message from the processor through the network interface controller (“*the network module*”).

103. Zhang also discloses that the “registration message *may* be sent...while the [sleep-enabled] computer system is sleeping.” EX1004 (Zhang), [0053]. Zhang explains that the sleep-enabled computer system/sleeping client can be in either the sleep mode or “a fully-on state” (*i.e. normal running mode*). EX1004 (Zhang), [0067]. Zhang therefore discloses that the registration message can be sent while the sleeping client is in the normal running mode because it also “*may* be sent...while the [sleep-enabled] computer system is sleeping.” EX1004 (Zhang), [0053].

Element [19f] in the sleep mode, the control unit sleeps, but the network module still keeps running and when receiving an apparatus wakeup packet sent to the network address of the networking apparatus from a connection server and generated by the connection server,

104. Zhang discloses Element [19f]. For example, Zhang discloses that the network interface controller may receive a “wakeup message” (*the apparatus wakeup packet*) from “the server computing system” and may “authenticate the wakeup message” while the sleep-enabled computer system is in “a sleep mode” (e.g., including the processor). EX1004 (Zhang), [0067], *see also* [0054 (explaining that the network interface controller (NIC) can be implemented with logic “responsible for maintaining the secure wakeup capability,” and “continue[s] to draw a small amount of power ... even while the computer system is otherwise in a sleep mode”). EX1004 (Zhang), [0053]. For the NIC to receive the wakeup packet from the server, the packet must necessarily be sent to the network address of the NIC. Zhang explains that in order to “authenticate the wakeup message” the NIC compares the received encrypted nonce to a pre-configured encrypted nonce—*i.e.*, the claimed “*compar[ing] the pre-stored feature data.*” EX1004 (Zhang), [0050], [0053].

Element [19g] compares the pre-stored feature data and a wakeup feature data being a segment of data of the apparatus wakeup packet to determine whether to wake up the entire networking apparatus.

105. Zhang discloses Element [19g]. As I discussed in Section VIII.I Element [19f], Zhang discloses that the NIC may “authenticate the wakeup message” while the sleep-enabled computer system is in “a sleep mode” (e.g., including the processor). As I also discussed above in Elements [19.c.ii], [19.d], Zhang describes “a pre-configured encrypted nonce” and “an encoded ID,” which together make up ***the pre-stored feature data***. EX1004, [0068], [0074]. Similarly, Zhang’s wakeup message that is sent from the server to the sleep-enabled computer includes an “encrypted nonce” and “encoded ID” which together are a segment of data in Zhang’s wakeup message and make up the ***“wakeup feature data.”*** EX1004, [0077-0078], *see also* [0068].

106. For example, as I described above in Section VIII.I, Elements [19c.ii], [19d], authenticating the wakeup message in Zhang includes “comparing the received encrypted nonce [a portion of the ***wakeup feature data***] to a pre-configured encrypted nonce [a portion of the ***pre-stored feature data***].” EX1004, [0068], [0077-0078]. Zhang states that “[i]f the comparison indicates that they are the same, the wakeup message may be authenticated and the NIC may wake up the [sleep-enabled] computer system.” EX1004 [0068]. Zhang thus discloses comparing a portion of the ***wakeup feature data*** (the “encrypted nonce”) and a portion ***the pre-stored***

feature data (the “pre-configured encrypted nonce”) to *determine whether to wakeup the entire networking apparatus*.

107. I also note that Element [19g] does not require that all of the *pre-stored feature data* and the *wakeup feature data* be compared and this limitation is met with the comparison of the “encrypted nonce” and “pre-configured encrypted nonce.”

108. However, Zhang also meets this limitation if all of the *pre-stored feature data* and the *wakeup feature data* needs to be compared. In other words, Zhang discloses the sleep-enabled device compares the “encoded ID” in the *wakeup message* with an encoded ID stored at the sleep-enabled computer as well as comparing the encrypted nonce with the pre-configured encrypted nonce. Specifically, Zhang discloses the wakeup message as including “the encoded ID of the sleeping client 408,” which is identical to an encoded ID stored at the sleep enabled computer. EX1004, [0074-0077]; *supra* [19c.ii]. Next, Zhang discloses authenticating the wakeup message (*see* EX1004, [0019-0020]) which, in this context would include comparing the encoded ID and encrypted nonce from the wakeup message (the entire *wakeup feature data*) with the encoded ID and pre-configured encrypted nonce stored at the sleep-enabled computer (the entire *pre-configured encrypted nonce*).

J. Claim 23

Element [23] The networking apparatus having a normal running mode and a sleep mode according to claim 19, wherein the storage unit stores a login data, before entering the sleep mode, the control unit generates, according to the login data and a feature flag, a sleep login packet having the login data, and the feature flag indicates that a running state of the networking apparatus is sleep.

109. Zhang discloses Element [23]. For example, Zhang explains that “the [sleep-enabled] computer system may be configured by a user (e.g., prior to entering the sleep mode) to have an identification name and/or number selected by that user.” EX1004 (Zhang), [0054]. The “identification name and/or number” qualifies as the claimed *login data* and is stored in the sleep-enabled computer device “prior to entering the sleep mode.” Zhang’s controller generates a “registration message” that includes the user selected “identification name and/or number.” EX1004 (Zhang), [0054]. Zhang explains that the registration message also includes the claimed *feature flag* that *indicates that a running state of the networking apparatus is sleep*. For example, Zhang explains that the disclosed messages includes a “CMD field” that “indicate[s] a type of [secure wake over internet] message, such as a registration message.” EX1005 (Zill), [0080]. Therefore, the CMD field in the registration message is the claimed *feature flag* which indicates that the running state of the sleep-enabled computer system is the sleep state because the registration message is

received at the server while “the [sleep-enabled] computer system remains in a sleep mode.” EX1004 (Zhang), [0057-0058], [0080].

K. Claim 24

Element [24] The networking apparatus having a normal running mode and a sleep mode according to claim 23, wherein the feature flag is located at a header of the sleep login packet.

110. Zhang discloses Element [19g]. As I discussed above in Section VIII.J, Element [23], Zhang’s “registration message” is the claimed *sleep login packet* and the “CMD field” in the registration message is the claimed *feature flag*. Zhang discloses that the “CMD field” is an example of a “‘secure wake over internet’ (‘SWOI’) header.” EX1004 (Zhang), [0080]. Accordingly, the “CMD field” is a header of the “registration message.”

L. Claim 25

Element [25] The networking apparatus having a normal running mode and a sleep mode according to claim 23, wherein in the sleep mode, the network module periodically sends the sleep login packet to the connection server.

111. Zhang discloses Element [19g]. For example, Zhang explains that “it may be desirable for the [sleep-enabled] computer system to *periodically* send a new registration message [(*the sleep login packet*)] to the server, in order to maintain the active connection with the server and thereby maintain the capability to receive a

wakeup message over the network, *as long as the [sleep-enabled] computer system remains in a sleep mode.*”

IX. GROUND 2: ZHANG IN COMBINATION WITH ZILL RENDERS OBVIOUS CLAIMS 1-3, 5, 7-8, 10-13, 15-16, 18-19, AND 23-25

A. The Zhang and Zill Combination

112. Based upon my knowledge and experience in the field of the '448 Patent and my review of Zhang and Zill, a POSITA would have been motivated to implement Zhang's systems and method for remotely waking up a sleep-enabled computer system in a predictable manner that employs Zill's suggested generation of wake up packets at a server. For example, Zhang describes a method for waking up the remote device (e.g., a sleep enabled computer system) that includes steps in which the server sends a query reply to a requesting computing system to provide information needed for the requesting computer system to generate a wakeup message at the requesting computer system. EX1004 (Zhang), [0061-0062]. Based on my review it would have been obvious to a POSITA to generate the wakeup message at the server as suggested in Zill. The following reasons, each independently and together collectively, support predictable and known benefits for combining Zhang and Zill.

113. As a first reason, a POSITA would have been motivated to implement Zhang in a predictable manner that employs Zill's suggested generation of wakeup packets at a server because generating the wakeup message at the server would

advantageously allow the sever to facilitate “remote wake up of [a] target host for all legacy remote hosts.” EX1005 (Zill), [0111]. Specifically, Zhang’s steps for generating a wakeup message at the requesting computing computer system would require the requesting computer system to operate required software and hardware to securely process the query reply and generate the wakeup message. *See* EX1004 (Zhang), [0061-0062], [0064-0065], [0077]. This could include requiring the requesting computer system to operate the highly complex security software, such as complex encryption algorithms, to securely process and manage the sensitive information in the query reply and wakeup message. *See* EX1004 (Zhang), [0077] (explaining that in order to generate a wakeup message the requesting computer system may encrypt the nonce “using the encrypt algorithm”). Accordingly, some requesting computer systems (in particular, “legacy remote hosts” as described in Zill) might not have the required software or hardware capability to execute the required software in order to securely process the query reply and generate the wakeup message. EX1005 (Zill), [0111]; EX1004 (Zhang), [0077]. A POSITA would have been motivated to instead generate the wakeup message at the server, as taught in Zill in order in order to accommodate more types of requesting computer systems, including legacy computer systems.

114. As a second reason, a POSITA would have been motivated to implement Zhang in a predictable manner that employs Zill’s suggestion for

generating the wakeup message at the server because having the server generate the wakeup message improves the security for waking up the sleep-enabled computer system. As explained in both Zhang and Zill, it is of upmost importance that the techniques used to wakeup sleep-enabled computer systems are secure. EX1004 (Zhang), [0036]; EX1005 (Zill), [0040], [0111]. For example, Zhang explains that “[s]ecurity should then also be a primary consideration in designing a system and method for remotely waking a sleeping computer system.” EX1004 (Zhang), [0036]. Generating the wakeup message at the server would improve the security for waking up a sleep-enabled computer system in several different ways.

115. For instances, the server is able to operate better security features for managing the most sensitive information regarding the sleep-enabled computer system as compared to an end user computer system. The server management also allows centralized control over security measures that can be used to implement robust security protocols, encryption, and update policies to quickly address new threats. Servers are also better protected against physical and network based attacks as compared to an end user computer system. *See also* EX1013 [0015-0016], (describing various servers that each include specialized software for performing functions), *see also* [0044], [0050].

116. As a third reason, a POSITA would have been motivated to implement Zhang in a predictable manner that incorporates Zill’s suggestion for generating the

wakeup message at the server because such an arrangement reduces the number of messages containing sensitive information by eliminating the query reply and the incoming wakeup to the server messages from being sent between the server and the requesting computer system. For example, this would eliminate the sending of authentication nonce and other sensitive content from Zhang's query reply messages and Zhang's incoming wakeup messages to the server messages. Reducing the number of messages sent reduces the number of opportunities for the packets to be intercepted by a malicious actor. This is particularly true with mobile devices, which are particularly vulnerable to such attacks. For example, mobile devices are more likely to connect to various network access points with varying levels of security which may expose some or all of the information in a message..

117. As a fourth reason, a POSITA would have been motivated to generate the wakeup message at the server as suggested because it is more efficient to generate the wakeup message at the server, among other reasons, because the server can include optimized hardware to efficiently complete tasks. It is also more efficient, in terms of bandwidth usage as well as usage of computational and power resources, to send fewer messages between the server the requesting computer system. In addition, when the requesting computer system, as in Zhang, performs operations for receiving a query reply, generating a wakeup message, and sending the wakeup message uses additional computational and power resources in comparison to server-

based wakeup message generation. This is particularly import in the case of mobile devices with limited available battery power.

118. As a fifth reason, a POSITA would have been motivated to generate the wakeup message at the server as suggested is because both Zhang and Zill are directed to remotely waking up sleep enabled computer systems, and in this context, a POSITA would have possessed ample skill to successfully implement the combination, among other reasons, because making the combination would simply require combining familiar elements according to known methods to yield predictable results. Considering the predictable electrical/network and software components involved in the combination, and the advanced state of the art at the time, a POSITA would have reasonably expected success achieving the combination before the priority date of the '448 Patent (August 29, 2016).

119. In particular, a POSITA would have been motivated to generate the wakeup message at the server as suggested because it was well known that, in server-client implemented methods, steps performed at a client computer could predictably be implemented at the server. Such alterative implementations were ubiquitous well before the filing date of the '448 Patent. *See* EX1011, [0035] (describing a server which “issues a wake-up packet” to remotely wake-up a system based on a “a strategic decision procedure”); EX1012, [0014], [0179] (describing “a wakeup server” that is configured to send “a wakeup request” to a target device in response

to receiving and processing an activation request from a terminal device); EX1014 [0055] (stating that “[u]pon receipt of the wakeup request, the notification server 110 computes a wakeup key and generates a wakeup packet”). In that regard, Zill employs a method for remotely waking up a sleep-enabled computer system by generating packets at the server instead of at an end user computer (EX1005 (Zill), [0108-0110]), and it would have obvious for a POSITA to do the same in the context of the method disclosed in Zhang.

B. Application of Ground 2

120. Ground 2 has substantial overlap with my analysis in Ground 1. Specifically, in the Zhang-Zill combination, Zhang teaches nearly all claim elements for the same reasons identified in ground 1. Ground 2 addresses elements [1c], [11c.iv], [19f] for the independent claims because the Zhang-Zill combination employs Zill’s suggestion for the wakeup message to be generated by the server. For dependent claims 7-8, 10, 15-16, 18, and 23-25, the analysis of Zhang’s teaching applied to those claim elements is identical for both Ground 1 and Ground 2 and I have not repeated my analysis for purposes of eliminating redundancy. I address further dependent claims 2-3, 5, and 12-13 because the Zhang-Zill combination also achieves those claim elements.

C. Claim 1

Element [1c] the connection server generating an apparatus wakeup packet according to the wakeup request packet and the wakeup information,

121. The Zhang and Zill combination satisfies Element [1c]. As I discussed above in Section V.B.2, the Zhang and Zill combination incorporates Zill's teachings for the claimed "***connection server generating an apparatus wakeup packet.***" Zill teaches a "resolution server 114" (i.e., the claimed "connection server"), which "remotely [awakens] target host 102" by generating and sending "a packet to target host 102 via the wakemeaddress associated with the target host 102." EX1005 (Zill), [0109-0110]. As I discussed in Section V.B.2, Zill explains that is advantageous for the server to manage the sending of the packet to the target host because it allows the "resolution server" to facilitate "remote wake up of target host for all legacy remote hosts." EX1005 (Zill), [0111]. Therefore, it would have been obvious for a POSITA to modify Zhang in view of Zill such that ***the connection server generates*** the wakeup message (the claimed ***apparatus wakeup packet***).

122. Zhang explains that the requesting computer system generates a "wakeup message" (the claimed ***apparatus wakeup packet***) using information provided in a query reply and compiled ***according to the*** query request (the claimed ***wakeup request packet***). EX1004 (Zhang), [0017], [0061], [0064], [0076]. The query reply includes a ***nonce*** (the claimed ***wakeup information***). EX1004 (Zhang),

[0017], [0061], [0066], [0076]. Zhang thus discloses generating the claimed “*apparatus wakeup packet* [Zhang’s “wakeup message”] *according to the wakeup request packet* [Zhang’s “query request”] *and the wakeup information* [Zhang’s “nonce”].” As described above, the Zhang and Zill combination would generate the claimed *apparatus wakeup packet* at the server instead of at an end user computer/requesting computer system.

D. Claim 2

Element [2] The remote wakeup method according to claim 1, wherein the step of generating the apparatus wakeup packet comprises: combining the wakeup request packet and the wakeup information into an unencrypted packet; and performing an encryption calculation on the unencrypted packet to generate the apparatus wakeup packet.

123. The Zhang and Zill combination satisfies Element [2]. As I discussed in Section IX.C, Element [1.c], the Zhang and Zill combination incorporates Zill’s teachings for the claimed “*connection server generating an apparatus wakeup packet*.” The query request qualifies as the claimed *wake up request packet* and Zhang discloses that the “query request may include just the user-selected human-readable ID of the [sleep-enabled] computer.” EX1004 (Zhang), [0059]; *see also* [0075] (explaining that the “query request may simply include the encoded ID of the sleeping client 408.”). Zhang also explains that the wakeup message (e.g., the outgoing wakeup message) includes “may again include the user-selected human-

readable ID of the [sleep-enabled] computer” and “the nonce.” EX1004 (Zhang), [0063-0064]. Accordingly, The Zhang and Zill combination discloses the server as *combining* the query request (the *wakeup request packet*) including the user-selected human-readable ID of the sleep-enabled computer and the nonce (the *wakeup information*) as part of the step of generating the *wakeup message*.

124. Based on my review, a POSITA would have understood that, in order to combine Zhang’s wakeup message with the nonce, the query message would be unencrypted (e.g., either as received or after being decrypted at the server) to allow the server to process the query request and obtain the correct wakeup information (e.g., the nonce corresponding to the user-selected human-readable ID of the sleep enabled computer system). Zhang also explains that the wakeup messages “may be encrypted, for an additional layer of security.” EX1004 (Zhang), [0013]. Zhang thus teaches *performing and encryption calculation* on the wakeup message that includes the combined user-selected human-readable ID and nonce to generate the outgoing wakeup message.

E. Claim 3

Element [3] The remote wakeup method according to claim 2, wherein one encryption unit of the encryption calculation comprises entire data or partial data of the device identifier and the wakeup information.

125. The Zhang and Zill combination satisfies Element [2]. As I discussed above in section IX.D, element [2], the Zhang and Zill combination teaches

performing an encryption calculation on a combination of Zhang’s query request and nonce. Therefore, *one encryption unit of the encryption calculation comprises entire data or partial data of Zhang’s “user-selected human-readable ID” (device identifier) and nonce (wakeup information).*

F. Claim 5

Element [5a] The remote wakeup method according to claim 2, further comprising: receiving, by the [sleep-enabled] apparatus, the apparatus wakeup packet;

126. The Zhang and Zill combination satisfies Element [5a]. For example, Zhang discloses that the sleep-enabled computer system receives the outgoing wakeup message (the claimed *apparatus wakeup packet*) EX1004 (Zhang), [0066-0068], *see also* [0078].

Element [5b] obtaining, by the [sleep-enabled] apparatus, a wakeup feature data from the apparatus wakeup packet, and the wakeup feature packet comprises entire data or partial data of the device identifier and the wakeup information;

127. The Zhang and Zill combination satisfies Element [5b]. I note that the terms “wakeup feature data” and “wakeup feature packet” each lacks antecedent basis. In this declaration I have treated both these terms as referring to the “wakeup feature data” originally introduced in [1.e.i].

128. As I discussed in above in Section VIII.A, Element [1.e.i], Zhang discloses the wakeup message includes a nonce as the claimed *wakeup feature data*.

This wakeup feature data can also include the “user-selected human-readable ID of the [sleep-enabled] computer” disclosed by Zhang. *See above* VIII.A, [1.c.i], [1e.i].

129. For instance, Zhang’s outgoing wakeup message includes a “nonce” and “user-selected human-readable ID of the [sleep-enabled] computer” which together are a segment of data in Zhang’s wakeup message and make up the “wakeup feature data.” EX1004, [0062-0063], see also [0077-0078], [0068]; *Supra* §V.A.2, [1e.i]. Accordingly, the “nonce” and “user-selected human-readable ID of the [sleep-enabled] computer” qualify as the claimed *wakeup feature data*.

130. Zhang discloses that the sleep-enabled computer compares the nonce (a portion of the *wakeup feature data*) to an original nonce. EX1004, [0068]. Therefore, Zhang discloses that the sleep-enabled computer obtains the nonce and “user-selected human-readable ID of the [sleep-enabled] computer” from the wakeup message (the *apparatus wakeup packet*) to authenticate “the wakeup message.” EX1004, [0062-0064], [0068], *see also* [0019-0020], [0077-0078]. The “user-selected human-readable ID of the [sleep-enabled] computer” and nonce (the *wakeup feature data*) includes *entire data of the device identifier and the wakeup information*.

Element [5c] comparing the wakeup feature data with a pre-stored feature data, wherein the pre-stored feature data is pre-stored in the [sleep-enabled] apparatus before the [sleep-enabled] apparatus sleeps; and

131. The Zhang and Zill combination satisfies Element [5c]. As I discussed above in Section IX.C, Element [1e.i]; Section IX.F, [5b], Zhang discloses the “user-selected human-readable ID” and nonce which together qualify as the claimed ***wakeup feature data***. *Supra* [5b]. Zhang’s sleep-enabled computer system compares the encrypted nonce to a pre-configured encrypted nonce. EX1004, [0068]. Zhang discloses that the original nonce may be “randomly generated by the [sleep-enabled computer].” EX1004, [0074], *see also* [0055], [0068]. Zhang also states that “the [sleep-enabled] computer system may be configured by a user (e.g., ***prior to entering the sleep mode***) to have an identification name and/or number selected by that user.” EX1004, [0054]. Zhang thus teaches the sleep-enabled computer must therefore store “user-selected human-readable ID” and the original nonce (the claimed ***pre-stored feature data***) before entering sleep mode. EX1004, [0068].

132. Additionally, based on my review, a POSITA would understand that encrypted nonce would be stored before Zhang’s sleep-enabled computer system enters sleep mode. Zhang explains that “the authentication information (e.g., the nonce and/or the encryption method) may be generated by the [sleep-enabled] computer system and/or selected by a user.” EX1004 (Zhang), [0055], *see also* [0056]

(describing the server as storing this information). A POSITA would understand that is preferable and often required to perform some of these operations before the sleep-enabled computer system enters the sleep mode, in order to access all of the functions, such as to store the encrypted nonce or to receive the selected authentication information from a user, of the sleep-enabled computer system.

Element [5d] when the wakeup feature data is consistent with the pre-stored feature data, waking up the entire [sleep-enabled] apparatus.

133. The Zhang and Zill combination satisfies Element [5c]. For instance, Zhang discloses comparing the received nonce to an “original nonce” and “[i]f the comparison indicates that they are the same, the wakeup message may be authenticated and the NIC may wake up the [sleep-enabled] computer.” EX1004, [0068]; *see also* [0034], [0067] (explaining that “[a]fter waking, the [sleep-enabled] computer system may be in a fully-on state”). The “user-selected human-readable ID” in the wakeup message is the same as the wakeup message configured at the sleep-enabled computer (e.g., as configured by a user). EX1004, [0054], [0063], *see also* [0056], [0059], [0065]. Accordingly, Zhang discloses ***waking up the entire [sleep-enabled] apparatus*** when the ***wakeup feature data*** (i.e., the “nonce” and “user-selected human-readable ID” from the wakeup message) is ***consistent*** with ***the pre-stored feature data*** (i.e., the “original nonce” and “user-selected human-readable ID” stored at the sleep-enabled computer).

G. Claim 11

Element [11c.iv] generates an apparatus wakeup packet according to the received wakeup request packet and the obtained wakeup information, and

134. The Zhang and Zill combination satisfies Element [11c.iv] for at least the same reasons as those discussed above in Section IX.C, Element [1c].

H. Claim 12

Element [12] The connection server according to claim 11, wherein the control unit combines the wakeup request packet and the wakeup information into one unencrypted packet and performs an encryption calculation on the unencrypted packet to generate an apparatus wakeup packet.

135. The Zhang and Zill combination satisfies Element [12] for at least the same reasons as those discussed above in Section IX.D, Element [2].

I. Claim 13

Element [13] The connection server according to claim 12, wherein one encryption unit of the encryption calculation comprises entire data or partial data of the device identifier and the wakeup information.

136. The Zhang and Zill combination satisfies Element [13] for at least the same reasons as those discussed above in Section IX.E, Element [3].

J. Claim 19

Element [19f] in the sleep mode, the control unit sleeps, but the network module still keeps running and when receiving an apparatus wakeup packet sent to the network address of the networking apparatus from a connection server and generated by the connection server,

137. The Zhang and Zill combination satisfies Element [19f]. As I discussed above in Section VIII.I, Element [19f], Zhang discloses “*in the sleep mode, the control unit sleeps, but the network module still keeps running and when receiving an apparatus wakeup packet sent to the network address of the networking apparatus from a connection server.*” Also as I discussed above in Section IX.C, Element [1c], Zill teaches the “*apparatus wakeup packet... generated by the connection server.*” Accordingly, the Zhang and Zill combination satisfies Element [19f].

X. GROUND 3: LIU IN COMBINATION WITH ZHANG RENDER OBVIOUS CLAIMS 1-3, 5, 7-13, AND 15-18

A. The Liu and Zhang Combination

138. Based upon my knowledge and experience in the field of the ‘448 Patent and my review of Liu and Zhang, a POSITA would have been motivated to implement Liu’s systems and method for remotely waking up an IP camera in a predictable manner that employs Zhang’s suggestions for using a secure wakeup message. EX1004 (Zhang), [0009], [0014], [0053]. For example, Zhang describes

an incoming wakeup message that includes “the user-selected human-readable ID of the [sleep-enabled] computer and a user-selected pre-shared password.” EX1004 (Zhang), [0065]. As I discussed above, “incoming” is to be understood from the perspective of the server. Zhang’s server authenticates the incoming wakeup message using the password. EX1004 (Zhang), [0019], [0066]. Next, after authenticating Zhang’s incoming wakeup message, Zhang’s server modifies this wakeup message (e.g., generates a modified wakeup message) and sends the modified wakeup message to the sleep-enabled computer system (*i.e.*, Liu’s IP camera). EX1004 (Zhang), [0066]; EX1006 (Liu), [0098-100]; EX1008, [0097-0099]. This combination incorporates Zhang’s teachings for a secure wakeup message, which is modified at the server to include Liu’s wake-up packet, thereby adding a layer of security to Liu’s otherwise unprotected wakeup process. There are several rationales to support the Liu and Zhang Combination, including the following which each independently and together collectively, support the Liu and Zhang Combination.

139. As a first reason, a POSITA would have been motivated to implement Liu in a predictable manner that incorporates Zhang’s teachings for using a secure wakeup message because Zhang’s teachings for the wakeup message advantageously improve the security for the systems and methods disclosed by Liu. As outlined in Zhang, many remote wakeup solutions “provide no security”

including techniques where “anyone could wake up a sleeping computing device if the IP address or MAC address is known.” EX1004 (Zhang), [0007]. Zhang further explains that that in such systems “it may be possible for anyone to wake up a sleeping computer system given basic information (e.g., the IP address)” including instances where the sleeping computer system is woken up “maliciously, such as by a hacker.” EX1004 (Zhang), [0012], Zhang explains that disclosed embodiments “are both capable of being performed through NAT without any special configuration and include security/authentication features.” EX1004 (Zhang), *see also* [0071]. Liu is an example of such an unsecured system that allows anyone to send the server a wake-up instruction with correct port number and communication address, to wake up the IP camera. EX1006 (Liu), [0095-0102]; EX1008, [0094-0101]. Zhang explains that the disclosed wakeup message provides a “provision of security.” EX1004 (Zhang), [0012], *see also* [0013]. For example, Zhang’s wakeup message can be authenticated by “one or both of a wakeup server and the sleeping computer system itself.” EX1004 (Zhang), [0013]. Accordingly, to advantageously provide an additional “provision of security,” a POSITA would have been motivated to modify Liu’s systems and methods to implement the secure wakeup messages taught by Zhang.

140. As a second reason, a POSITA would have been motivated to implement Liu in a predictable manner that incorporates Zhang’s teachings for a

secure wakeup message because utilizing Zhang’s teachings for the incoming wakeup message, including a “user selected human-readable ID” of the sleep-enabled computer, would have predictably improved the user experience of Liu’s method for waking up an IP camera. Zhang explains, in the context of Zhang’s query request, that it would be preferable for the user to request waking up a sleep-enabled computer using only “a user selected human-readable ID” because it would be “presumably easier to remember.” EX1004 (Zhang), [0059]. In the context of Liu, it would be preferable that the user enter a “user selected human-readable ID” to a client device so the client device can generate and send the incoming wakeup instruction with the “user selected human-readable ID” to the server because it would be easier for the user to remember the “user selected human-readable ID” as compared to an IP address.

141. As a third reason, a POSITA would have been motivated to implement incorporates Zhang’s teachings for a secure wakeup message into Liu is because both Liu and Zhang are directed to remotely waking up sleep-enabled computer devices, and in that context, a POSITA would have possessed ample skill to successfully implement the combination, among other reasons, because making the combination would simply require combining familiar elements according to known methods to yield predictable results. And considering the predictable electrical/network and software components involved in the combination and the

relatively advanced state of the art at the time, a POSITA would have reasonably expected success achieving the combination before the Critical Date of the ' 448 patent (*i.e.*, August 29, 2016).

B. Claim 1

Element [1pre] A remote wakeup method, comprising:

142. Liu discloses Element [1pre]. For example, Liu describes a method for remotely waking up an IP camera. EX1006 (Liu), [0094], Figure 7; EX1008, [0093].

Element [1a] a connection server receiving a wakeup request packet from a [requesting] apparatus,

143. The Liu and Zhang combination satisfies Element [1a]. As I discussed above in Section X.A, the Liu and Zhang combination incorporates Zhang's teachings for a wakeup message that is sent from a requesting computer system to the server. EX1004 (Zhang), [0062], [0065].

Element [1a.i] wherein the wakeup request packet comprises a device identifier of a [sleep-enabled] apparatus,

144. The Liu and Zhang combination satisfies Element [1a.i]. As I discussed above in Section X.A, the Liu and Zhang combination incorporates Zhang's teachings for a secure wakeup message to add security to Liu's "wake-up instruction." To achieve this predictable result, Zhang teaches that its "wakeup message" (*i.e.*, the claimed ***wakeup request packet***) may include "the user-selected human-readable ID

of the [sleep-enabled] computer [the claimed *device identifier*] and a user-selected pre-shared password.” EX1004 (Zhang), [0063], *see also* [0065], [0077-0078].

Element [1a.ii] wherein the [requesting] apparatus is connected to the connection server via local area network or internet;

145. Liu discloses Element [1a.ii]. For example, Liu describes “a terminal, such as a mobile client, (the claimed *requesting apparatus*) that is connected to “a cloud-end *server* ... to perform remote access control...using a mobile network.” EX1006 (Liu), [0042], Figures 1 and 7; EX1008, [0041], Figures 1 and 7. Based on my review a POSITA would have understood that these disclosures as teachings of the claimed *[requesting] apparatus being connected to the server via ... [the] internet*.

Element [1b] the connection server obtaining wakeup information stored in the connection server according to the wakeup request packet,

146. The Liu and Zhang combination satisfies Element [1b]. For example, the server in Liu “searches, *according to* the port number and the communication address of the IP camera to be woken up, for the wake-up packet [(the claimed *wakeup information*)]for waking up the IP camera.” EX1006 (Liu), [0099]; EX1008, [0098]. In the Liu and Zhang combination, the server would predictably search its associated memory, in which the wakeup information was previously stored (corresponding to the claimed *stored in the connection server*) for the wake-up

packet just as Zhang's server stores, and subsequently searches it as needed. EX1004 (Zhang), [0015], [0018], [0043], Figure 2, element 204, Claims 7, 9, 12, 15.

147. Liu further discloses that the server receives the port number and communication address from a received wakeup instruction. EX1006 (Liu), [0099]; EX1008, [0098]. As I discussed above in Section X.A, the Liu and Zhang combination, incorporates Zhang's incoming wakeup message, which includes identification information for the [sleep-enabled] computer system in lieu of the communication address in Liu's "wakeup instruction." In view of this combination, a POSITA would have understood that the server searches according to the identification information for the [sleep-enabled] computer system in the wakeup message (i.e. "*the wakeup request packet*") to obtain the wake-up packet [(the claimed *wakeup information*)].

Element [1b.i] wherein the wakeup information stored in the connection server is the same as wakeup information stored in the [sleep-enabled] apparatus;

148. Liu discloses Element [1b.i]. For example, Liu discloses that the IP camera has "a preset wake-up packet" and that the IP camera "switches from the standby state to the working state when the wake-up packet received by the IP camera matches a preset wake-up packet." EX1006 (Liu), [0099]; EX1008, [0098]. The wake-up packet therefore must be obtained by the server and sent to the IP camera is the same as the wakeup information stored in the IP camera.

Element [1c] the connection server generating an apparatus wakeup packet according to the wakeup request packet and the wakeup information,

149. The Liu and Zhang combination satisfies Element [1c]. As I discussed above in section X.A, the Liu and Zhang combination, incorporates Zhang's teachings for a modified "wakeup message." For example, Zhang teaches that the "server may modify or authenticate the wakeup message before sending the wakeup message to the [sleep-enabled] computer system." EX1004 (Zhang), [0066]. In view of Liu's disclosure, modifying the wakeup message would include obtaining a "wake-up packet" (as discussed *above* X.B, Element [1b]) in order to modify (i.e., generate) a wakeup message that includes Liu's "*wake-up packet*." EX1004 (Zhang), [0066]; 1006; [0098-0100]; 1008, [0097-0099]. The modified wakeup message is therefore generated according to the incoming wakeup message and the obtained "*wake-up packet*." EX1004 (Zhang), [0066]; 1006; [0098-0100]; 1008, [0097-0099].

Element [1c.i] wherein the apparatus wakeup packet comprises the device identifier of the [sleep-enabled] apparatus from the wakeup request packet and the obtained wakeup information;

150. The Liu and Zhang combination satisfies Element [1c.i]. As I discussed above in Section X.A, the Liu and Zhang combination incorporates Zhang's teachings for a modified wakeup message (i.e., ***the apparatus wakeup packet***). As I also discussed above in Section X.B, Element [1a.i], the incoming/pre-modified wakeup message includes identification information for the [sleep-enabled]

computer system (i.e., *the device identifier*). As discussed above in Section X.B, Element [1c], in this combination the incoming modified wakeup message is modified to add Liu's "wake-up packet." Therefore, the modified wakeup message includes *the device identifier* from the incoming/pre-modified wakeup message and the obtained "wake-up packet" (i.e., *wakeup information*).

Element [1d] the connection server obtaining a network address corresponding to the [sleep-enabled] apparatus from a storage unit of the connection server according to the wakeup request packet;

151. The Liu and Zhang combination satisfies Element [1d.i]. As I discussed above in Section X.A, the Liu and Zhang combination incorporates, Zhang's modified wakeup message as the claimed *the wakeup request packet*. Zhang explains that an incoming wakeup request includes "identification information for the [sleep-enabled] computer system and authentication information." EX1004 (Zhang), [0062], *see also* [0063], [0065], [0077-0078]. As I discussed above in Section X.B Element [1c], Zhang teaches sending a modified wakeup message to "*the sleep enabled apparatus*." Based on my review a POSITA would have understood that the server must obtain *a network address corresponding to the [sleep-enabled] apparatus from a storage unit of the connection server* in order for the server to modify and send a modified wakeup packet to "*the [sleep enabled] apparatus*." Specifically, such modification of the packet would be required in the Liu and Zhang combination in the case where Zhang's incoming wakeup does not

include a network address, but instead includes “user-selected human-readable ID of the [sleep enabled computer].” See EX1004 (Zhang), 0065. Accordingly, the server would be required to obtain the IP address from its memory to send the modified wakeup message.

152. Zhang also expressly teaches *the connection server obtaining a network address corresponding to the [sleep-enabled] apparatus from a storage unit of the connection server according to the wakeup request packet*. For example, Zhang teaches that the [sleep-enabled] computer system sends a registration message to the server that includes “an IP address of the [sleep-enabled] computer system” (the claimed “network address”). EX1004 (Zhang), [0054], [0056]. Zhang goes on to explain that the sleep-enabled computer system was registered at the server by “*storing* some or all of the information included in the registration message from the [sleep-enabled] computer system [(such as the *IP address*)] in a memory.” EX1004 (Zhang), [0056]. In this context Zhang’s “memory” is the claimed *storage unit of the server*. Zhang also teaches an incoming “wakeup message” that is modified at the server and sent to the sleep enabled computer system. EX1004 (Zhang), [0066]. The wakeup message is described in Zhang as including a “user-selected human-readable ID.” EX1004 (Zhang), [0065]. Based on my review, it would have been obvious to a POSITA to configure the server to obtain the stored IP address of the sleep-enabled computer system according to the incoming wakeup message.

153. Based on my review a POSITA would have been motivated to incorporate Zhang's teachings for the server managing the IP address of the sleep-enabled computer system (e.g., IP camera) as outlined above. Zhang's server manages the IP address for the sleep-enabled computer system by periodically receiving registration messages including a current IP address of the sleep-enabled computer system from the network interface controller ("NIC") of the sleep-enabled computer system. EX1004 (Zhang), [0011], [0022], [0058]. Such a combination would predictably allow Zhang's server to maintain an active connection with the NIC. EX1004 (Zhang), [0058]. Implementing Zhang's teachings for the server's maintain a connection with the NIC of the sleep-enabled computer system (e.g., the IP camera) with Liu would allow Liu's system to function in additional network environments including environments where the IP camera undergoes network address translation (NAT). EX1004 (Zhang), [0006], [0010]. In fact, Zhang explains in some such environments, systems like Liu's "may be unable to receive a wake command unless proper de-militarized zone (DMZ)/port forwarding and static address resolution protocol (ARP) are set at the NAT router." EX1004 (Zhang), [0006], *See also* [0010]. Therefore, a POSITA would have been motivated to incorporate Zhang's teachings for ***"the connection server obtaining a network address corresponding to the [sleep-enabled] apparatus from a storage unit of the connection server according to the wakeup request packet."***

Element [1e] the connection server sending the apparatus wakeup packet to the [sleep-enabled] apparatus based on the network address,

154. The Liu and Zhang combination satisfies Element [1e]. As I discussed above in Section IX, the Liu and Zhang combination incorporates Zhang's modified wakeup message, which is sent to the sleep-enabled computer system. EX1004 (Zhang), [0066-0067], *see also* [0078]. Based on my review, a POSITA would have understood that sending the apparatus wakeup packet from the server to the correct sleep-enabled computer system would have been based on the network address.

Element [1e.i] wherein wakeup feature data is a segment of data of the apparatus wakeup packet and is for determining whether the entire [sleep-enabled] apparatus be awoken.

155. The Liu and Zhang combination satisfies Element [1e.i]. As discussed above, Liu's wake-up packet qualifies as the claimed ***wakeup feature data***. As I discussed above in Section X.B, Elements [1c], Elements [1c.i], the combination incorporates Zhang's modified wakeup message with Liu's wake-up packet, as the ***apparatus wakeup packet***. Liu's wake-up packet is therefore a segment of data of the modified wakeup message. Liu discloses that "[t]he IP camera switches from the standby state to the working state when the IP camera detects that the wake-up packet from the server matches a preset wake-up packet." EX1006 (Liu), [0099]; EX1008, [0098]. Liu also describes a process for switching from the standby state to the working state by "power[ing] on each module of the IP camera. EX1006 (Liu),

[0102]; EX1008, [0101]. Liu thus teaches that the wake-up packet is used for *determining whether the entire [sleep-enabled] apparatus be awoken.*

C. Claim 2

Element [2] The remote wakeup method according to claim 1, wherein the step of generating the apparatus wakeup packet comprises: combining the wakeup request packet and the wakeup information into an unencrypted packet; and performing an encryption calculation on the unencrypted packet to generate the apparatus wakeup packet.

156. The Liu and Zhang combination satisfies Element [2]. As discussed above, Liu's wake-up packet qualifies as the claimed wakeup feature data. As I discussed above in Section X.B, Element [1c], the combination incorporates Zhang's teachings of a modified wakeup message that is generated by adding (e.g., combining) Liu's wake-up packet with Zhang's incoming wakeup message. A POSITA would have understood that, in order to combine Liu's wake-up packet with Zhang's incoming wakeup message, the incoming wakeup message would be unencrypted (e.g., either as received or after being decrypted at the server) to allow the server to process the information and obtain the correct wakeup information (e.g., the wake-up packet corresponding to the ID of the sleep enabled computer system). Zhang also teaches that the wakeup messages "may be encrypted, for an additional layer of security." EX1004 (Zhang), [0013]. Based on my review, a POSITA would have been motivated to perform an encryption calculation on the combined incoming

wakeup message and the wake-up packet in order to generate the modified wakeup message” to provide an additional layer of security.

D. Claim 3

Element [3] The remote wakeup method according to claim 2, wherein one encryption unit of the encryption calculation comprises entire data or partial data of the device identifier and the wakeup information.

157. The Liu and Zhang combination satisfies Element [3]. As I discussed above in Section X.C, element [2], the Liu and Zhang combination teaches performing an encryption calculation on a combination of Zhang’s wakeup message and Liu’s wake-up packet. The wakeup message taught by Zhang includes a “user-selected human-readable ID.” EX1004 (Zhang), [0065]. Accordingly, ***one encryption unit of the encryption calculation comprises entire data or partial data of Zhang’s “user-selected human-readable ID” (device identifier) and Liu’s “wake-up packet” (wakeup information).***

E. Claim 5

Element [5a] The remote wakeup method according to claim 2, further comprising: receiving, by the [sleep-enabled] apparatus, the apparatus wakeup packet;

158. The Liu and Zhang combination satisfies Element [5a]. For example, the Liu and Zhang combination incorporates Zhang’s modified wake up message, which is received at Liu’s IP camera, as discussed in element [1e]. Above Section X.B, Element [1e].

Element [5b] obtaining, by the [sleep-enabled] apparatus, a wakeup feature data from the apparatus wakeup packet, and the wakeup feature packet comprises entire data or partial data of the device identifier and the wakeup information;

159. The Liu and Zhang combination satisfies Element [5b]. For example, as discussed above in Section X.B, Elements [1e], [5a], Section V.C.2, the Liu and Zhang combination incorporates Zhang's modified wakeup message as the ***apparatus wakeup packet***, and Zhang's modified wakeup message includes Liu's wakeup packet as the claimed ***wakeup information***.

160. As I discussed in Section X.B, Elements [1e.i], in the Liu and Zhang combination Liu's wake-up packet is the claimed ***wakeup feature data***. The ***wakeup feature data*** can also include the "identification information" (i.e., ***the device identifier***) for the sleep-enabled computer. *See above at* Section X.B, Elements [1.c.i], [1.e.i]. For example, Zhang's outgoing wakeup message includes a "nonce" and "user-selected human-readable ID of the [sleep-enabled] computer" which together are a segment of data in Zhang's wakeup message and make up the "wakeup feature data." EX1004, [0062-0063], see also[0077-0078], [0068]; Above Section X.B, Element [1e.i].

161. The Liu and Zhang combination incorporates Zhang's modified wakeup message as the ***apparatus wakeup packet***, and Zhang's modified wakeup message includes Liu's wakeup packet as the claimed ***wakeup information***. As I

discussed above in Section X.B, Element [1e.i], in the Liu and Zhang combination Liu's wake-up packet is the claimed *wakeup feature data*. Based on my review, a POSITA would have understood that the obtained *wakeup feature data* at the server comprises the *wakeup information* in the modified wakeup message.

162. Liu explains that the “IP camera switches from the standby state to the working state when the IP camera detects that the wake-up packet from the server matches a preset wake-up packet.” EX1006 (Liu), [0101]; EX1008, [0100]. Accordingly, the evidence is clear that a POSITA would have understood that the IP camera would obtain wakeup feature data including the “user-selected human-readable ID of the [sleep-enabled] computer” and Liu's wake-up packet from Zhang's wakeup message in order to compare the wake-up packet from the server with a preset wake-up packet.

Element [5c] comparing the wakeup feature data with a pre-stored feature data, wherein the pre-stored feature data is pre-stored in the [sleep-enabled] apparatus before the [sleep-enabled] apparatus sleeps; and

163. The Liu and Zhang combination satisfies Element [5c]. As I discussed in Section X.E, Element [5b], the claimed *wakeup feature data* includes Liu's wakeup packet and Zhang's “user-selected human-readable ID.” Liu explains that “IP camera switches from the standby state to the working state when the IP camera detects that the wake-up packet from the server matches a preset wake-up packet.” EX1006 (Liu), [0101]; EX1008, [0100]. Liu also discloses that “[t]he wake-up

packet is pre-agreed between the server and the IP camera” and a “manufacturer may define the wake-up packet pre-agreed between the server and the IP camera in order to adapt to interconnection between different servers and IP cameras.” EX1006 (Liu), [0101]; EX1008, [0100]. Accordingly, Liu discloses that the preset wake-up packet (*i.e., the pre-stored feature data*) is stored in *in the [sleep-enabled] apparatus before the [sleep-enabled] apparatus sleeps*, for example, by a manufacturer well before the IP camera is set to a standby or sleep mode.

164. Similarly, Zhang explains that “the [sleep-enabled] computer may be configured by a user (e.g., prior to entering the sleep mode) to have an identification name and/or number selected by that user.” EX1004, [0054]. The Liu and Zhang combination thus teaches the IP camera must therefore store Zhang’s “user-selected human-readable ID” and Liu’s wakeup-packet (the claimed pre-stored feature data) before entering sleep mode. EX1004, [0068].

Element [5d] when the wakeup feature data is consistent with the pre-stored feature data, waking up the entire [sleep-enabled] apparatus.

165. The Liu and Zhang combination satisfies Element [5d]. For example, Liu explains that “[t]he IP camera switches from the standby state to the working state when the IP camera detects that the wake-up packet [*i.e., wakeup feature data*] from the server matches a preset wake-up packet [*i.e., pre-stored feature data*].” EX1006 (Liu), [0101], EX1008, [0100]. *See also Above* Section X.B, Element [1e.i].

166. Similarly, the “user-selected human-readable ID” in Zhang’s wakeup message is the same as the wakeup message configured at the sleep-enabled computer. EX1004, [0054], [0063], *see also* [0056], [0059], [0065]. Therefore, the Liu and Zhang combination teaches *waking up the entire [sleep-enabled] apparatus* when the *wakeup feature data* (i.e., Liu’s “wake-up packet” and Zhang’s “user-selected human-readable ID” from the wakeup message) is consistent with *the pre-stored feature data* (i.e., Liu’s preset wake-up packet and the “user-selected human-readable ID” stored at the IP camera).

F. Claim 7

Element [7] The remote wakeup method according to claim 1, further comprising: receiving a sleep login packet from the [sleep-enabled] apparatus; and recording a running state of the [sleep-enabled] apparatus as a sleep state in the storage unit according to the sleep login packet.

167. Liu discloses Element [7]. For example, Liu explains that “the server receives the status update notification information [(i.e., the claimed *sleep login packet*)] from the IP camera such that when the status of the IP camera changes, the server can update and maintain [(e.g. *record*)] the status of the IP camera in time.” EX1006 (Liu), [0078], EX1008, [0077]. Liu also explains that the status of the IP camera can include “a working state” and a “standby state” (e.g., a sleep state). EX1006 (Liu), [0075], EX1008, [0074]. Liu thus discloses, the server *receiving* “status update notification information” (i.e., a *sleep login packet*) from the IP

camera (i.e., *the [sleep-enabled] apparatus*) and recording the status information as a sleep state in the storage unit according to the “status update notification information.”

G. Claim 8

Element [8] The remote wakeup method according to claim 7, wherein the sleep login packet has a feature flag, and the feature flag indicates that the running state of the [sleep-enabled] apparatus is the sleep state.

168. Liu teaches Element [8]. For example, based on my review a POSITA would have understood that the “status update notification information” would include a field to indicate the running state of claimed “*[sleep-enabled] apparatus*” to the server. This field would include a feature flag (e.g., a predefined byte) to indicate that the “*[sleep-enabled] apparatus*” is in the sleep state.

H. Claim 9

169. The Liu and Zhang combination renders claim 9 obvious by incorporating Zhang’s query request and query reply. Specifically, Zhang discloses the requesting computer system sending a query request to the server to receive a query reply with information needed by requesting computer system in order to generate a wakeup message. EX1004 (Zhang), [0061]. The query reply can include, for example, “user-selected human-readable ID of the [sleep-enabled] computer.” EX1004 (Zhang), [0061]. Additionally, this information indicates that the sleep-enabled computer system is asleep by providing information required to wake up the

sleep-enabled computer system. There are multiple different reasons that would have motivated a POSITA to incorporate Zhang's query request and query reply into Liu's method for remotely waking up an IP camera.

170. As a first reason, Zhang's query request and query reply provide useful information to the client device. For example, a user would be interested in determining a current status of devices, such as whether an IP camera is an awake mode or a sleep mode. Zhang's query request and query reply would allow a user to obtain this information without waking up or ping the sleep-enabled computer system/IP camera.

171. As a second reason, both Liu and Zhang are directed to remotely waking up sleep enabled computer systems/devices, and in this context, a POSITA would have possessed ample skill to successfully implement the combination, among other reasons, because making the combination would simply require combining familiar elements according to known methods to yield predictable results. Considering the predictable electrical/network and software components involved in the combination and the relatively advanced state of the art at the time, a POSITA would have reasonably expected success achieving the combination before the Critical Date of the '448 patent (August 29, 2016).

Element [9a] The remote wakeup method according to claim 1, further comprising: receiving a connection request packet from the [requesting] apparatus, wherein the connection request packet is used to request for performing communication connection to the [sleep-enabled] apparatus;

172. The Liu and Zhang combination satisfies Element [9a]. Zhang describes “a query request may be received by the server.” EX1004 (Zhang), [0059]. Zhang teaches that “the query request may be initiated by a user (e.g., a user of both the sleep-enabled computer system and [requesting] computer system) of the [requesting] computer system, as a first step towards waking the [sleep-enabled] computer system over the network.” EX1004 (Zhang), [0059]. Zhang’s query request thus qualifies as the claimed *connection request packet* and is used *to request for performing communication connection to the [sleep-enabled] apparatus*.

Element [9b] determining a running state of the [sleep-enabled] apparatus according to the connection request packet; and

173. The Liu and Zhang combination satisfies Element [9b]. Zhang explains that the server sends a “query reply” to the requesting computer system. EX1004 (Zhang), [0061]. Zhang teaches that “[t]he query reply may include information needed by the [requesting] computer system in order to generate and send a wakeup message to the [requesting] computer system.” EX1004 (Zhang), [0061]. Accordingly, Zhang teaches that the server determines *a running state of the [sleep-*

enabled] apparatus according to the connection request packet, by determining that the sleep-enabled computer system is asleep in order to generate a query reply that is used to wake up the sleep-enabled computer system according to the query request. EX1004 (Zhang), [0061].

Element [9c] when the running state of the [sleep-enabled] apparatus is a sleep state, replying to the [requesting] apparatus that the [sleep-enabled] apparatus sleeps.

174. The Liu and Zhang combination satisfies Element [9a]. As I discussed above in Section X.H element [9b], Zhang teaches the server sending a “query reply” in reply to the requesting computer system with “information needed by the [requesting] computer system in order to generate and send a wakeup message to the [sleep-enabled] computer system.” EX1004 (Zhang), [0061]. Accordingly, the “query reply” in Zhang is sent when the running state of the [sleep-enabled] computer system is a sleep state. EX1004 (Zhang), [0061]. The “query reply” in Zhang indicates to the requesting computer system that the [sleep-enabled] apparatus is asleep because the “query reply” includes “information needed by the [requesting] computer system in order to generate and send a wakeup message.” EX1004 (Zhang), [0061].

I. Claim 10

Element [10] The remote wakeup method according to claim 1, wherein the steps of obtaining the wakeup information and the network address comprise: reading the wakeup information and the network address that correspond to the device identifier from a storage unit.

175. The Liu and Zhang combination satisfies Element [5d]. For example, the server in Liu “searches, according to the port number and the communication address of the IP camera to be woken up, for the wake-up packet [(the claimed ***wakeup information***)] for waking up the IP camera.” EX1006 (Liu), [0099]; EX1008, [0098]. Liu explains that the server receives the port number and communication address from a received wakeup instruction. EX1006 (Liu), [0099]; EX1008, [0098]. As I discussed above in Section X.A, the Liu and Zhang combination, incorporates Zhang’s incoming wakeup message which includes a “user-selected human-readable ID” for the [sleep-enabled] computer system in lieu of the communication address in Liu’s “wakeup instruction.” As I discussed above in Section X.A, Element [1d], the Liu and Zhang combination teaches ***the connection server obtaining a network address corresponding to the [sleep-enabled] apparatus from a storage unit of the connection server according to the wakeup request packet.***

176. Accordingly, a POSITA would have understood that Liu’s wake-up packet (i.e. ***wakeup information***) and Zhang’s IP address (i.e. ***network address***)

correspond to “the user-selected human-readable ID” in a data structure stored at the server to allow the server to search for the wake-up packet and the IP address with the information included in the incoming wakeup message. Based on my review, a POSITA would also have understood that this information must be stored in the server to allow for the server to obtain this information in response to receiving Zhang’s incoming wakeup message (i.e., wakeup request packet).

J. Claim 11

Element [11pre] A connection server, comprising:

177. Liu discloses Element [11pre]. For example, Liu describes a server. EX1006 (Liu), [0042], [0094-0107], FIGs. 1, 7; EX1008, [0041], [0093-106], FIGs. 1, 7.

Element [11a] a network module;

178. Liu discloses Element [11a]. For example, Liu describes “a receiving module” and a “sending module” which collectively are the claimed network module. EX1006 (Liu), [0119], [0126] (disclosing that “the receiving module 901 is further configured to receive a wake-up instruction from the client), [0127] (discloses that “[t]he sending module 902 is further configured to send a wake-up packet to the IP camera); EX1008, [0118], [0125-0126].

Element [11b] a storage unit, which stores a network address and wakeup information that correspond to a [sleep-enabled] apparatus; and

179. The Liu and Zhang combination satisfies Element [11b]. As I discussed above in Section X.I, Element [10], the Liu and Zhang combination teaches the server reading the wakeup information and the network address that correspond to the device identifier from a storage unit. The IP address (network address) and wake-up packet (wakeup information) thus correspond to a [sleep-enabled] apparatus.

Element [11c] a control unit, which [11c.i] connects to the network module and storage unit,

180. The Liu and Zhang combination satisfies Elements [11c] and [11c.i]. Based on my review, a POSITA would have understood that Liu's server must include a control unit (e.g., a processing unit) that is connected to the network module and storage unit in order for these components to operate as discussed in Liu. *See* EX1006, [0042]; EX1008, [0041]. In fact, such an arrangement would be obvious and well known to a POSITA. In fact, Zhang discloses such a server as described *Above* Section X.B, Elements [1c], [1c.i].

Element [11c.ii] receives a wakeup request packet from a [requesting] apparatus through the network module,

181. The Liu and Zhang combination satisfies Element [11c.ii] for at least the same reasons discussed above in Section X.B, Element [1a].

Element [11c.iii] obtains the wakeup information stored in the storage unit and the network address stored in the storage unit according to the wakeup request packet,

182. The Liu and Zhang combination satisfies Element [11c.iii] for at least the same reasons discussed above in Section X.B, Elements [1b], [1d].

Element [11c.iv] generates an apparatus wakeup packet according to the received wakeup request packet and the obtained wakeup information, and

183. The Liu and Zhang combination satisfies Element [11c.iv] for at least the same reasons discussed above in Section X.B, Element [1c].

Element [11c.v] sends the generated apparatus wakeup packet to the [sleep-enabled] apparatus through the network module according to the network address,

184. The Liu and Zhang combination satisfies Element [11c.v] for at least the same reasons discussed above in Section X.B, Element [1e].

Element [11d] wherein the wakeup request packet comprises a device identifier of the [sleep-enabled] apparatus, and

185. The Liu and Zhang combination satisfies Element [11d] for at least the same reasons discussed above in Section X.B, Element [1a.i].

Element [11e] the apparatus wakeup packet comprises the device identifier from the wakeup request packet and the obtained wakeup information of the [sleep-enabled] apparatus,

186. The Liu and Zhang combination satisfies Element [11e] for at least the same reasons discussed above in Section X.B, Element [1c.i].

Element [11f] wherein the wakeup information stored in the connection server is the same as wakeup information stored in the [sleep-enabled] apparatus, and

187. The Liu and Zhang combination satisfies Element [11f] for at least the same reasons discussed above in Section X.B, Element [1b.i].

Element [11g] wherein wakeup feature data is a segment of data of the apparatus wakeup packet and is for determining whether the entire [sleep-enabled] apparatus be awoken.

188. The Liu and Zhang combination satisfies Element [11g] for at least the same reasons discussed above in Section X.B, Element [1e.i].

K. Claim 12

Element [12] The connection server according to claim 11, wherein the control unit combines the wakeup request packet and the wakeup information into one unencrypted packet and performs an encryption calculation on the unencrypted packet to generate an apparatus wakeup packet.

189. The Liu and Zhang combination satisfies Element [12] for at least the same reasons discussed above in Section X.C, Element [2].

L. Claim 13

Element [13] The connection server according to claim 12, wherein one encryption unit of the encryption calculation comprises entire data or partial data of the device identifier and the wakeup information.

190. The Liu and Zhang combination satisfies Element [13] for at least the same reasons discussed above in Section X.D, Element [3].

M. Claim 15

Element [15] The connection server according to claim 11, wherein the storage unit further stores a running state of the [sleep-enabled] apparatus, and the control unit receives a sleep login packet from the [sleep-enabled] apparatus through the network module and updates the running state of the [sleep-enabled] apparatus in the storage unit as a sleep state according to the sleep login packet.

191. The Liu and Zhang combination satisfies Element [15] for at least the same reasons discussed above in Section X.F, Element [7].

N. Claim 16

Element [16] The connection server according to claim 15, wherein the sleep login packet has a feature flag, and the feature flag indicates that the running state of the [sleep-enabled] apparatus is the sleep state.

192. The Liu and Zhang combination satisfies Element [16] for at least the same reasons discussed above in Section X.G, Element [8].

O. Claim 17

Element [17] The connection server according to claim 11, wherein when the control unit receives a connection request packet used to request for performing communication connection to the [sleep-enabled] apparatus from the [requesting] apparatus through the network module, the control unit determines a running state of the [sleep-enabled] apparatus according to the connection request packet and when determining that the running state of the [sleep-enabled] apparatus is a sleep state, replies to the [requesting] apparatus that the [sleep-enabled] apparatus sleeps.

193. The Liu and Zhang combination satisfies Element [17] for at least the same reasons discussed above in Section X.H, Claim 9.

P. Claim 18

Element [18] The connection server according to claim 11, wherein the storage unit records the device identifier and correspondences between the device identifier and the wakeup information and between the network address and the wakeup information.

194. The Liu and Zhang combination satisfies Element [18]. As I discussed above in Section X.B, Elements [1b], [1d], [11b], the Liu and Zhang combination discloses storing an IP address of the camera, a wake-up packet for the camera, such that the server can obtain this information by searching according to identification information for the [sleep-enabled] computer system. A POSITA would have understood that the server would record a correspondence between “the user-selected human-readable identification information for the [sleep-enabled] computer

system” (device identifier) the “wake-up packet” (wakeup information) and the IP address (network address), for example, by storing this information in a data structure in a database. A POSITA would have also understood, by way of these correspondences the server has recorded a correspondence (such as relationship in a database) between each of the device identifier, the network address, and the wakeup information.

XI. OVERVIEW OF CONCLUSIONS FORMED

195. This declaration explains the conclusions that I have formed based on my independent analysis. To summarize those conclusions:

- Based upon my knowledge and experience, and my review of the materials listed above, Claims 1, 7-8, 10-11, 15-16, 18-19, 23-25 of the ’448 patent are anticipated by Zhang (EX1004). *See above*, Ground 1—Section VIII.
- Based upon my knowledge and experience, and my review of the materials listed above, Claims 1-3, 5, 7-8, 10-13, 15-16, 18-19, 23-25 of the ’448 patent are rendered obvious by Zhang (EX1004) in view of Zill (EX1005). *See above*, Ground 2—Section IX.
- Based upon my knowledge and experience, and my review of the materials listed above, Claims 1-3, 5, 7-13, 15-18 of the ’448 patent are

rendered obvious by Liu (EX1006) in view of Zhang (EX1004). *See above*, Ground 3—Section X.

XII. ADDITIONAL REMARKS

195. I currently hold the opinions expressed in this declaration. But my analysis may continue, and I may acquire additional information and/or attain supplemental insights that may result in added observations

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

Dated: July 19, 2024

By: *Vlad Kardashov*
Vlad Kardashov, B.S.C
Toronto, Ontario

APPENDIX A

Contact

vlad@kardashov.com

www.linkedin.com/in/vkard
(LinkedIn)

Top Skills

P&L Results

Setting Strategic Direction

Business Strategy

Languages

Hebrew (Native or Bilingual)

English (Native or Bilingual)

Honors-Awards

CES 2013 Innovation Award

CES 2014 Innovation Award

DIGITAL TRENDS - FLIR FX BEST
OF CES 2014

Patents

POWERED SECURITY CAMERA
TOOL-FREE INSTALLATION

MODULAR CAMERA MONITORING
SYSTEMS AND METHODS

PROXIMITY-BASED CAMERA
CONFIGURATION

SYSTEMS AND METHODS FOR
VIDEO SYNOPSES

SYSTEMS AND METHODS FOR
DYNAMIC DATA MANAGEMENT

Vlad Kardashov

President at iENSO

Toronto, Ontario, Canada

Summary

Experienced executive professional with extensive experience leading Product Development and R&D organizations in the fast-paced high-tech industry.

Experience

iENSO

3 years 9 months

President

October 2023 - Present (9 months)

Toronto, Ontario, Canada

Vice President Of Engineering

October 2020 - October 2023 (3 years 1 month)

Greater Toronto Area, Canada

FLIR Systems

8 years

Vice President, Engineering. Security Division.

2016 - October 2020 (4 years)

Toronto, Canada Area

Director, Engineering & Product Development

2012 - 2016 (4 years)

Toronto, Canada Area

- Managing IP & Networking Innovative Products Design & Development
- Cloud Technologies and Cloud-based services
- Edge & Cloud-based video analytics
- Embedded systems group
- Mobile systems and apps dev
- Leading R&D groups in multiple locations in North America and Europe
- Managing the FLIR IP products line and related services starting from the inception stage to the final deployment
- Managing FLIR Cloud Platform Group

Flextronics Innovative Development, Strategic Products Group
Director, System Integration and Test
2011 - 2012 (1 year)
Toronto, Canada Area

Strategic Products Engineering Division

Emblaze Mobile
6 years

VP Technology
July 2009 - July 2011 (2 years 1 month)
Israel

ELSE Ltd. is a design house for cutting-edge mobile technology. Founded in 2001 and headquartered in Israel, ELSE Ltd. develops next generation innovative mobile solutions with an emphasis on user experience as the differentiating factor of its product.

Director, HW & System Validation
2005 - July 2009 (4 years)
Israel

Pelephone
4 years

Manager, Engineering and Network Compliance
2003 - July 2005 (2 years)
Israel

Pelephone is an Israeli-based largest cellular carrier

www.pelephone.co.il

System Validation Engineer, Team Lead since 2002
2001 - 2003 (2 years)
Israel

Education

Babson College
Executive Leadership and Innovation Program

The Singalovsky College, Tel Aviv
BS.C, Electrical Engineering, RF