

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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APPLE INC.,  
Petitioner

v.

S.M.R INNOVATIONS LTD and Y.M.R TECH LTD  
Patent Owners

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*Inter Partes* Review Case No. IPR2024-01047  
U.S. Patent No. 9,699,223

**DECLARATION OF DR. SAYFE KIAEI  
IN SUPPORT OF PETITION FOR *INTER PARTES* REVIEW OF  
U.S. PATENT NO. 9,699,223**

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**CLAIM LISTING**

**Claim 1:**

**Claim 1[Pre]:** A method of routing media data stream, comprising:

**Claim 1(a):** wirelessly receiving at a mobile device, from an external source via a local wireless communication network, a media data stream transmitted according to a streaming protocol and comprising media content selected from a group consisting of: audio content and video content;

**Claim 1(b):** scanning said local wireless communication network using said mobile device to identify a plurality of devices, identified as compatible to handle said media content, said plurality of devices are wirelessly connected to said local wireless communication network and wirelessly announce an availability for accepting a routed media via said local wireless communication network;

**Claim 1(c):** selecting, based on a user interaction made with said mobile device and while said media data stream is streamed to said mobile device from said external source according to said streaming protocol, one of said plurality of devices;

**Claim 1(d):** setting up a wireless communication link with said selected compatible device via said local wireless communication network;

**Claim 1(e):** causing a routing of said media data stream of media content to said selected device via said wireless communication link for streaming said media

data stream according to said streaming protocol for presentation of said media content by a media player of said selected device.

**Claim 5:**

The method of claim 1, wherein said selecting comprises displaying a menu at said mobile device to allow a user to perform said user interaction.

**Claim 7:**

The method of claim 1, further comprising transmitting said media content to a plurality of copies so as to perform said routing to a number of said plurality of devices.

**Claim 8:**

The method of claim 1, wherein said setting up comprising transforming said media content into a form that accords with a media type requirement of said selected device.

**Claim 9:**

The method of claim 1, wherein said selecting comprises carrying out a selection between devices found to be available, based on a predetermined user profile.

**Claim 10:**

The method of claim 1, further comprising encrypting said media data stream of media content before routing to said selected device.

**Claim 11:**

The method of claim 1, wherein said wirelessly announce is wirelessly announce an availability for accepting a routed media and an availability for accepting a type of said routed media.

**Claim 13:**

The method of claim 1, wherein before said causing said media data stream is constantly received and presented by said mobile device while being delivered by said external source before said scanning is performed.

**Claim 14:**

**Claim 14[Pre]:** A mobile apparatus of routing media data stream, comprising:

**Claim 14(a):** a receiver wirelessly adapted to receive a media data stream transmitted according to a streaming protocol and comprising media content from an external source via a local wireless communication network, said media content is selected from a group consisting of; audio content and video content;

**Claim 14(b):** a scouting detector adapted to scan said local wireless communication network to identify a plurality of devices, identified as compatible to handle said media content, said plurality of devices are wirelessly connected to said local wireless communication network and wirelessly announce an availability for accepting a routed media via said local wireless communication network;

**Claim 14(c):** a controller adapted to select, based on a user interaction made with said mobile apparatus, one of said plurality of devices and to instruct a setting up of a wireless communication link with said selected device via said local wireless communication network;

**Claim 14(d):** wherein said controller is adapted to instruct the routing of said media data stream of media content to said selected device via said wireless communication link for streaming said media data stream according to said streaming protocol for presentation of said media content by a media player of said selected device.

**Claim 15:**

The mobile apparatus of claim 14, wherein said mobile apparatus is one of a cell phone, a handheld device, and a personal digital assistant (PDA).

**Claim 16:**

The mobile apparatus of claim 14, further comprising a user interface associated with said scouting detector for allowing a user to select between available compatible media handling devices to reroute said media data stream thereto.

**Claim 18:**

The mobile apparatus of claim 14, wherein said controller further comprising control functionality operable to carry out said rerouting through locally available infrastructure.

**Claim 19:**

The mobile apparatus of claim 14, wherein said media content is one of voice data, bidirectional voice data, bidirectional audio data, bidirectional video data, a game session, an interactive game session, a television broadcast, and a radio broadcast.

**Claim 20:**

The mobile apparatus of claim 14, wherein said scouting detector is operable to determine media type requirements of each of said plurality of devices.

**Claim 22:**

**Claim 22[Pre]:** A computer program product for routing media data stream, said computer program product comprising:

**Claim 22(a):** a non-transitory computer readable storage medium having stored thereon:

**Claim 22(b):** first program instructions executable by a processor to wirelessly receive at a mobile device, from an external source via a local wireless communication network, a media data stream transmitted according to a streaming protocol and comprising media content selected from a group consisted of: audio content and video content;

**Claim 22(c):** second program instructions executable by the processor to scan said local wireless communication network using said mobile device to identify a

plurality of devices, identified as compatible to handle said media content, said plurality of devices are wirelessly connected to said local wireless communication network and wirelessly announce an availability for accepting a routed media via said local wireless communication network;

**Claim 22(d):** third program instructions executable by the processor to select, based on a user interaction made with said mobile device and while said media data stream is streamed to said mobile device from said external source according to said streaming protocol, one of said plurality of devices;

**Claim 22(e):** fourth program instructions executable by the processor to set up a wireless communication link with said selected device via said local wireless communication network; and

**Claim 22(f):** fifth program instructions executable by the processor to cause a routing of said media data stream of media content to said selected device via said wireless communication link streaming said data stream of media content according to said streaming protocol for presentation of said media content by a media player of said selected device.

I, Sayfe Kiaei, declare as follows:

**I. INTRODUCTION AND QUALIFICATIONS**

1. I am over the age of 21 and am competent to make this declaration. I make this declaration based on facts and matters within my own knowledge and on information provided to me by others, and, if called as a witness, I could and would competently testify to the matters set forth herein.

**A. Educational Background and Professional Experience**

2. My qualifications are stated more fully in my curriculum vitae, which is attached as Exhibit A. Below is a summary of my education, work experience, and other qualifications.

3. I earned a Ph.D. in 1987 from Washington State University in Electrical, Computer, and Energy Engineering. From 1985 through 1987, while working toward my Ph.D., I worked with Boeing on the development of signal processing and control systems.

4. From 1987 through 1993, I was a tenured Professor at Oregon State University in the Electrical and Computer Engineering Department.

5. From 1993 to 2002, I was a Senior Member of Technical Staff with the Wireless Technology Center and Broadband Operations at Motorola Inc. With the Wireless Integrated Technology Center (WITC) group of Motorola, I was responsible for the development of wireless system for cellular system, 2-way

Radios, RF integrated circuits, GPS, and Bluetooth. I represented Motorola at the Bluetooth (BT) SIG group forming the first BT standard. I was also responsible for the development of BT and GPS IC solutions for Motorola's Cellular phones. With the Broadband Operation, I worked with the team on the development of Single-Chip COPPERGOLD™ Motorola Digital Subscriber Lines (DSL) transceivers. I worked on the development of broadband transceivers for MODEMS including DSL, SDSL, VDSL, and Optical communication systems. I also represented Motorola in the T1E1 and ETSI, and cable MODEM DOCIS standards.

6. Since 2001 I have held the position of Motorola Endowed Chair Professor in Analog and Radio Frequency Integrated Circuitry at the School of Electrical, Computer, and Energy Engineering at Arizona State University in Tempe, Arizona. I am also the Director of the National Science Foundation Center, Connection One. Connection One is an industry/university cooperative research center with focus on communication systems. The center has over thirty industrial members and five university members focused on developing communication systems, sensors, electronics, bio-electronics, and networking technologies.

7. At Arizona State University, I have developed and taught courses on Communications, Broadband Wirelines and Wireless Transceivers, Electronics, VLSI, Analog IC design, RFIC, communications, and related areas. In my over thirty years of academic experience, I have taught university courses and done research in

electronics, RF and wireless system, bio-electronics, networking, communication systems, and sensors. I have graduated over 100 M.S. and Ph.D. students working under my supervision on their thesis, and many of them are professors in academia, or have senior positions in the industry. Currently, I have 8 M.S., Ph.D., and postdoc students working with me in my lab on research related to communication and networking systems, wireless systems, RF, and integrated circuits. My research is funded by various sources, including industry, federal agencies including NSF, DARPA, ONR, DOE, and other, with an average total research funding of \$1M per year.

8. I have been conducting research, publishing papers, and supervising graduate students working on communication system, signal process, audio processing, GPS, BT, DSL, RFIC, and communication transceivers for the past 40 years. I have published over two hundred journal and conference papers covering topics such as wireless systems, power management, low-power electronics, sensors, radio frequency, integrated circuits (IC), filter design, and related areas. A list of my publications can be found in my CV, attached as Exhibit A. I also have over 10 patents and patent applications in electronics, RF, and low-power bio-electronics.

9. I am an IEEE Fellow, a distinction and the highest level of IEEE membership awarded by the IEEE directors to recognize a high level of demonstrated extraordinary accomplishments. The IEEE is the Institute of Electrical

and Electronics Engineers, the world's largest association of technical professionals whose objectives include the educational and technical advancement of electrical and electronic engineering, telecommunications, computer engineering, and related disciplines. I am a member of the IEEE Circuits and Systems Society, IEEE Solid State Circuits Society, and IEEE Communication Society, IEEE RF and Microwave committees, IEEE International Symposium on Low Power Electronics and Design (ISLPED), IEEE Signal Processing Society, IEEE Fellow Selection Committee, and many other International Electrical Engineering societies. I was one of the key organizers to establish the IEEE Radio Frequency Integrated Circuits (RFIC) symposium in 1995, and IEEE International Symposium on Low Power Electronics and Design (ISLPED) in 1997. I have been on the executive committee, and technical committee of RFIC and ISLPED for the last 16 years. The RFIC and ISLPED Symposia have grown and is now the premier international symposium in the world where the latest RF, low-power electronics, wireless, and bio-electronic circuits and components are presented.

10. I have received several awards including the Carter Best Teacher Award, the IEEE Darlington Award (which is given for the best technical paper on circuits and systems in the IEEE Circuits and Systems Society), and the Motorola 10X Rapid Design Cycle Reduction Award.

11. I have been one of the key organizers of the IEEE International Symposium on Low Power Electronics and Design (ISLPED) since 1997. I have published papers and organized sessions on techniques for low-power cellular phones at ISLPED. I have published a number of papers on the design and development of low-power RF, wireless transceivers, sensors, and low-power bioelectronics.

12. I have also been a consultant on various projects with Motorola, Intel (designing 2G, 3G mobile telephone transceivers, Internet-of-Things (IOT), and sensors), Texas Instrument (developing 3G cellular and Bluetooth technologies), Sony Wireless (developing GPS technologies), Tektronics (designing wireless systems), and various other consultancies. During my work in industry, I have designed and contributed to the design of many wireless systems for commercial products. Many of my designs are still in use today in products manufactured by the companies I have worked for, including Motorola, Intel, Sony, and more.

13. My compensation is not dependent on the outcome of these proceedings or the content of my opinions. To the best of my knowledge, I have no financial interest in either party or in the outcome of this proceeding.

## II. METHODOLOGY; MATERIALS CONSIDERED

14. I have relied upon my education, knowledge, and experience with the technology of communication networks, as well as the other materials as discussed in this declaration in forming my opinions.

15. For this work, I have been asked to review U.S. Patent No. 9,699,223 (“the ’223 Patent”) (Ex. 1001) including the specification and claims, and the ’223 Patent’s prosecution history (“’223 File History”) (Ex. 1002). In developing my opinions relating to the ’223 Patent, I have considered the materials cited or discussed herein, including those listed below.

- U.S. Patent No. 9,699,223 (“’223 Patent”) (Ex. 1001)
- Prosecution History for the ’223 Patent (“’223 FH”) (Ex. 1002)
- U.S. Patent No. 7,536,182 to Zhang (“Zhang”) (Ex. 1004)
- U.S. Patent No. 7,295,809 to Moore (“Moore”) (Ex. 1005)
- U.S. Patent No. 7,058,414 to Rofheart et al. (“Rofheart”) (Ex. 1006)
- U.S. Patent No. 7,574,474 to Thornton et al. (“Thornton”) (Ex. 1007)
- U.S. Patent App. Pub. No. 2002/0076025 to Liversidge et al. (“Liversidge”) (Ex. 1008)
- U.S. Patent App. Pub. No. 2003/0061493 to Angelo et al. (“Angelo”) (Ex. 1009)
- U.S. Patent App. Pub. No. 2002/01782789 to Janik et al. (“Janik”) (Ex. 1010)
- International Publication No. WO 01/74024 to Hartmaier et al. (“Hartmaier”) (Ex. 1011)
- European Patent Application No. EP1132847 to Han et al. (“Han”) (Ex. 1012)
- U.S. Patent App. Pub. 2002/0102998 to Lin (“Lin”) (Ex. 1013)
- U.S. Patent No. 7,580,005 to Palin (“Palin”) (Ex. 1014)
- U.S. Patent App. Pub. No. 2003/0110234 to Egli et al. (“Egli”) (Ex. 1015)
- U.S. Patent No. 6,910,068 to Zintel et al. (“Zintel”) (Ex. 1016)

- Bluetooth Core Specification version 1.1 (“*Bluetooth V1.1 Core Spec.*”) (Ex. 1017)
- U.S. Patent No. 6,901,273 to Lutnaes (“*Lutnaes*”) (Ex. 1018)
- U.S. Patent App. Pub. No. 2002/0141548 to Boda (“*Boda*”) (Ex. 1019)
- International Publication No. WO 02/19152 to Bergman et al. (“*Bergman*”) (Ex. 1020)
- Matthew S. Gast. *802.11 Wireless Networks The Definitive Guide*. O’Reilly & Associates. April 2002. (“*Gast*”) (Ex. 1021)
- U.S. Patent No. 6,925,108 to Miller et al. (“*Miller*”) (Ex. 1022)
- Jim Geier. *Wireless LANs*. 2<sup>nd</sup> Edition. Sams Publishing. July 2001. (“*Geier*”) (Ex. 1023)
- U.S. Patent No. 6,212,282 to Mershon (“*Mershon*”) (Ex. 1024)
- U.S. Patent No. 6,526,287 to Lee (“*Lee*”) (Ex. 1025)
- U.S. Patent App. Pub. No. 2002/0101367 to Geiger et al. (“*Geiger*”) (Ex. 1026)
- U.S. Patent App. Pub. No. 2002/0186770 to Jawerth et al. (“*Jawerth*”) (Ex. 1027)
- U.S. Patent App. Pub. No. 2003/0013438 to Darby (“*Darby*”) (Ex. 1028)
- U.S. Patent App. Pub. No. 2003/0139966 to Sirota et al. (“*Sirota*”) (Ex. 1029)

16. I have considered these materials from the viewpoint of a POSITA as of the priority date of the ’223 Patent. For the purposes of this declaration, I have been asked to assume that the priority date of the ’223 Patent is July 25, 2002. I note that my opinions provided in this declaration are made from the perspective of a POSITA as of this priority date of the ’223 Patent, unless expressly stated otherwise. To the extent that I use any verb tense in this declaration that is present tense (e.g., “a POSITA would understand” instead of “a POSITA would have understood”), such verb tense should be understood to be my opinion as of the ’223 Patent’s

priority date (again, unless expressly stated otherwise). I merely use the present verb tense for ease of reading.

### **III. OVERVIEW AND LEGAL STANDARDS**

17. In formulating my opinions, I have been instructed to apply certain legal standards. I am not a lawyer. I do not expect to offer any testimony regarding what the law is. Instead, the following sections summarize the law as I have been instructed to apply it in formulating and rendering my opinions found later in this declaration. I understand that, in an *inter partes* review (“IPR”) proceeding, patent claims may be deemed unpatentable if it is shown that they were anticipated or rendered obvious in view of the prior art. I understand that prior art in an IPR review is limited to patents or printed publications that predate the priority date of the patent at issue. I understand that questions of claim clarity (definiteness) and enablement cannot be considered as a ground for considering the patentability of a claim in these proceedings.

#### **A. Person of Ordinary Skill in the Art**

18. I understand that the ’223 Patent, the record of proceedings at the Patent Office (which I understand is called the “File History” or “Prosecution History”), and the teachings of the prior art are evaluated from the perspective of a person of ordinary skill in the art (“POSITA”). I understand that the factors considered in determining the ordinary level of skill in the art include: (i) the levels of education

and experience of persons working in the field; (ii) the types of problems encountered in the field; and (iii) the sophistication of the technology. I may also consider, if available, the education level of the inventor, prior art solutions to the problems encountered in the art, and the rapidity with which innovations are made in the relevant art.

19. I understand that a person of ordinary skill in the art is not a specific real individual, but rather a hypothetical individual having the qualities reflected by the factors above. This hypothetical person has knowledge of all prior art in the relevant field as if it were arranged on a workshop wall and takes from each reference what it would teach to a person having the skills of a POSITA.

### **B. Obviousness**

20. I understand that a claim may be invalid under 35 U.S.C. § 103(a) if the subject matter described by the claim as a whole would have been “obvious” to a hypothetical POSITA in view of a single prior art reference or in view of a combination of references at the time the claimed invention was made. Therefore, I understand that obviousness is determined from the perspective of a hypothetical POSITA. I further understand that a hypothetical POSITA is assumed to know and to have all relevant prior art in the field of endeavor covered by the patent in suit and all analogous prior art. I understand that obviousness in an IPR review proceeding

is evaluated using a preponderance of the evidence standard, which means that the claims must be more likely obvious than nonobvious.

21. I also understand that an analysis of whether a claimed invention would have been obvious should be considered in light of the scope and content of the prior art, the differences (if any) between the prior art and the claimed invention, and the level of ordinary skill in the pertinent art involved. I understand as well that a prior art reference should be viewed as a whole. I understand that in considering whether an invention for a claimed combination would have been obvious, I may assess whether there are apparent reasons to combine known elements in the prior art in the manner claimed in view of interrelated teachings of multiple prior art references, the effects of demands known to the design community or present in the marketplace, and/or the background knowledge possessed by a POSITA. I also understand that other principles may be relied on in evaluating whether a claimed invention would have been obvious, and that these principles include the following:

- A combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results;
- When a device or technology is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or in a different one, so that if a POSITA can implement a predictable variation, the variation is likely obvious;

- If a technique has been used to improve one device, and a POSITA would have recognized that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill;
- An explicit or implicit teaching, suggestion, or motivation to combine two prior art references to form the claimed combination may demonstrate obviousness, but proof of obviousness does not depend on or require showing a teaching, suggestion, or motivation to combine;
- Market demand, rather than scientific literature, can drive design trends and may show obviousness;
- In determining whether the subject matter of a patent claim would have been obvious, neither the particular motivation nor the avowed purpose of the named inventor controls;
- One of the ways in which a patent's subject can be proved obvious is by noting that there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent's claims;
- Any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed;

- “Common sense” teaches that familiar items may have obvious uses beyond their primary purposes, and in many cases a POSITA will be able to fit the teachings of multiple patents together like pieces of a puzzle;
- A POSITA is also a person of ordinary creativity, and is not an automaton;
- A patent claim can be proved obvious by showing that the claimed combination of elements was “obvious to try,” particularly when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions such that a POSITA would have had good reason to pursue the known options within his or her technical grasp; and
- One should not use hindsight in evaluating whether a claimed invention would have been obvious.

22. I also understand that an obviousness determination includes the consideration of various factors such as: (1) the scope and content of the prior art, (2) the differences between the prior art and the asserted claims, (3) the level of ordinary skill in the pertinent art, and (4) the existence of secondary considerations such as commercial success, long-felt but unresolved needs, failure of others, and so forth.

23. I am informed that it is improper to combine references where the references teach away from their combination. I am informed that a reference may be said to teach away when a person of ordinary skill in the relevant art, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the patent applicant. In general, a reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the patentee. I am informed that a reference teaches away, for example, if (1) the combination would produce a seemingly inoperative device, or (2) the references leave the impression that the product would not have the property sought by the patentee. I also am informed, however, that a reference does not teach away if it merely expresses a general preference for an alternative invention but does not criticize, discredit, or otherwise discourage investigation into the invention claimed.

24. I am informed that even if a *prima facie* case of obviousness is established, the final determination of obviousness must also consider "secondary considerations" if presented. In most instances, the patentee raises these secondary considerations of non-obviousness. In that context, the patentee argues an invention would not have been obvious in view of these considerations, which include: (a) commercial success of a product due to the merits of the claimed invention; (b) a

long-felt, but unsatisfied need for the invention; (c) failure of others to find the solution provided by the claimed invention; (d) deliberate copying of the invention by others; (e) unexpected results achieved by the invention; (f) praise of the invention by others skilled in the art; (g) lack of independent simultaneous invention within a comparatively short space of time; and (h) teaching away from the invention in the prior art.

25. I am further informed that secondary considerations evidence is only relevant if the offering party establishes a connection, or nexus, between the evidence and the claimed invention. The nexus cannot be based on prior art features. The establishment of a nexus is a question of fact. While I understand that Patent Owner here has not offered any secondary considerations at this time, I will supplement my opinions in the event that Patent Owner raises secondary considerations during the course of this proceeding.

### **C. Analogous Art**

26. I have been informed that for a prior art reference to be proper for use in an obviousness analysis, the reference must be “analogous art” to the claimed invention. I have been informed that a reference is analogous art to the claimed invention if: (1) the reference is from the same field of endeavor as the claimed invention (even if it addresses a different problem); or (2) the reference is reasonably pertinent to the problem faced by the inventor (even if it is not in the same field of

endeavor as the claimed invention). In order for a reference to be “reasonably pertinent” to the problem, it must logically have commended itself to an inventor’s attention in considering his problem. In determining whether a reference is reasonably pertinent, one should consider the problem faced by the inventor, as reflected either explicitly or implicitly, in the specification. I believe that all of the references that my opinions in this IPR are based upon are well within the range of references a person having ordinary skill in the art would consult to address the type of problems described in the Challenged Claims.

#### **D. Claim Construction**

27. I understand that the claim terms in this IPR will be construed according to their plain and ordinary meaning as understood in light of the claim language, the patent’s description, and the prosecution history viewed from the perspective of a POSITA. I further understand that where a patent defines claim language, the definition in the patent controls, even if there are other definitions that might be understood by those working in the art.

#### **IV. LEVEL OF A PERSON OF ORDINARY SKILL**

28. Based on my review and analysis of the ’223 Patent, the prior art cited herein, and the ordinary skill factors described in this section, a POSITA in the field of the ’223 Patent at the time of the earliest possible priority date (July 25, 2002) would have been knowledgeable regarding the field of communication networks. In

my experience working in this field, most workers of ordinary skill in the art as of the earliest possible priority date of July 25, 2002, would have had a master's degree in computer engineering, electrical engineering, or a related field, with at least 2 years of experience with wireless communications. *See, e.g., '223 Patent* (Ex. 1001), 1:20-27, 4:21-41, 11:4-12:21 (describing embodiments of '223 Patent). A person with less relevant practical experience but with additional education can also qualify as a POSITA in the field of the '223 Patent. When I refer to the understanding of a POSITA, I am referring to the understanding of such a person as of July 25, 2002.

29. As of July 25, 2002, as set forth in detail above and in my cv, I had more than ordinary skill in the art. I am, however, familiar with the skills and knowledge possessed by those I would have considered to be of ordinary skill in the art as of that date.

30. My opinions provided in this declaration would not change in view of minor modifications to this level of ordinary skill.

## **V. OVERVIEW OF THE TECHNOLOGY**

31. The features described and claimed in the '223 Patent were routine as of July 25, 2002. In the following paragraphs, I briefly summarize the technology background for a few key features relevant to the opinions set forth herein.

### **A. Wireless Networking**

32. Wireless networking was well known before the priority date of the '223 Patent. In general, wireless networking is similar to wired networking in that both involve connecting a number of devices so that the devices may communicate, transfer information, stream data or media, or otherwise communicate electronically, but wireless networking performs such functionality without the need for wires connecting the devices together. *Gast* (Ex. 1021), 3 (“Like all networks, wireless networks transmit data over a network medium. The medium is a form of electromagnetic radiation.”). *Geier* (Ex. 1023), 34 (“Wireless networks perform functions similar to their wired ethernet and token-ring counterparts.”), 34-35 (“1. The medium provides a bit pipe (a path for data to flow) for the transmission of data. ... 4. Routing mechanisms move the data from the originating source to the intended destination.”).

33. Numerous standards and commercially available technology existed for wireless networking before the priority date of the '223 Patent. For example, IEEE 802.11 included well-known standards for connecting devices in a wireless local area network (WLAN). *Gast*, 1 (“Wireless telephony has been successful because it enables people to connect with each other regardless of location. New technologies targeted at computer networks promise to do the same for Internet connectivity. The most successful wireless networking technology th[u]s far has been 802.11.”). By

April 2002, wireless networking such as WLAN was already widely used and IEEE 802.11 in particular had gained success. *Gast*, 6 (“802.11 is a success *now*. Apple initiated the pricing moves that caused the market for 802.11 equipment to explode in 1999. Price erosion made the equipment affordable and started the growth that continues today.”).

34. IEEE 802.11 includes various versions that were developed over time. For example, the first version of the 802.11 standard was from 1997 and featured “both frequency-hopping and direct-sequence modulation techniques.” *Gast*, 6. The second version of the IEEE 802.11 standard, 802.11a, was from 1999, with 802.11a products released in 2000. *Id.* 802.11b was the third version of the standard, and was the “most common 802.11 equipment as this book was written.” *Id.* I note that *Gast* published in April 2002 and noted that 802.11b was the most common 802.11 standard used in the 2002 timeframe.

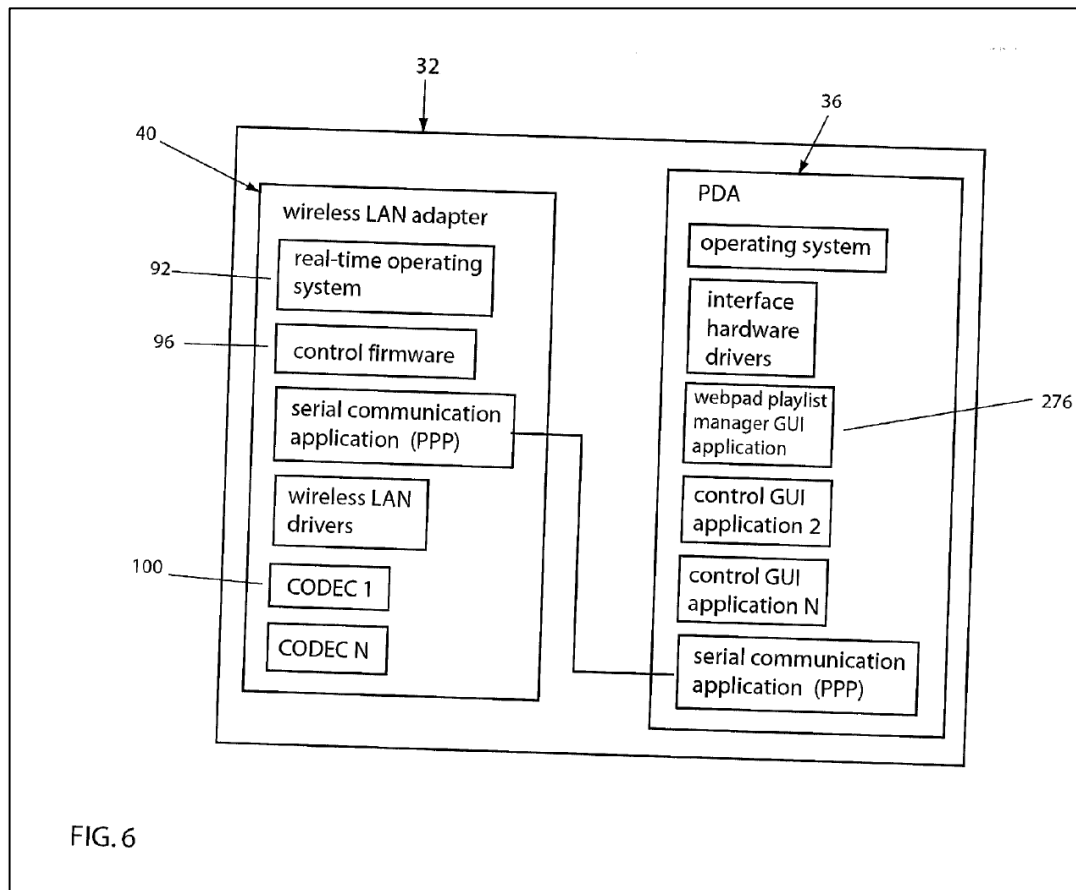
35. In a network, a server device generally provides a function, content, or data to a requesting device called a client device. *Geier* (Ex. 1023), 47 (“The server-based network operating system provides a centralized platform for applications and data storage for mobile users.”), *id.* (“A network operating system (NOS) such as Microsoft NT Server, hosted on a high-end PC, provides file, print, and applications services. Many NOSs are server oriented ... where the core application software and databases reside. In most cases, the appliances [clients] will interface via TCP/IP

with application software or a database running on the NOS.”). Similarly, the client device directs a user’s commands to a server. *Geier*, 48 (“Client software, located on the end-user’s appliance, directs the user’s commands to the local appliance software or steers them out through the wireless network. The software residing on a wireless appliance is very similar to software that runs on a wired appliance.”). It was well known that a server connected to the Internet (often referred to as a Web server) provides content to requesting client devices. For example, a web server may provide music, video, data, or files based on content stored at the server. *Janik*, [0043] (“PC has access via content services to downloadable digital audio files such as MP3 formatted audio files, MPEG-2 and MPEG-4 video files, as well as digital audio and video streams from Internet 8 servers.”), [0044] (“PC can also route Internet 8 streams of content to webpad 32”).

36. In a wireless network, devices connect to each other using hardware and software or other programming instructions. Wireless networks operated in layers such as Network, Data Link, and Physical (or PHY layer) or network. For example, mobile devices often include a wireless interface, such as a wireless transceiver, to send and receive signals wirelessly to/from other devices connected to the wireless network. *Gast* teaches one example. *Gast*, 3 (“The two media that have seen the widest use in local-area applications are infrared light and radio waves. ... Radio waves can penetrate most office obstructions and offer a wider coverage

range. It is no surprise that most, if not all, 802.11 products on the market use the radio wave physical layer.”).

37. Another example of mobile devices with a wireless transceiver is *Janik*, which teaches a wireless LAN adapter 40 in a “webpad 32” (e.g., a PDA [personal digital assistant]). *Janik* (Ex. 1010), [0041]-[0043].



*Janik*, Fig. 6.

38. *Janik* further teaches components of wireless LAN adapter 40 include a wireless LAN transceiver 44. *Janik* (Ex. 1010), [0049]. *Janik* teaches wireless LAN transceiver 44 of wireless LAN adapter 40 is “capable of sending and receiving

data using radio frequencies via a wireless data transfer protocol. Technology for such a LAN is currently available and includes the Symphony wireless networking access point provided by Proxim, Inc.” *Janik*, [0051].

### **B. Device Discovery and Service Discovery**

39. Before the priority date of the '223 Patent, it was known that mobile devices performed device discovery to locate other nearby devices with which to connect.

40. One well known industry standard for discovering nearby devices, pairing with devices, and performing communications between said devices was the Bluetooth specification. To establish a new Bluetooth connection, Bluetooth enabled devices use what is called the “Inquiry” and “Page” (or “Paging”) procedures, which are generally described in the Bluetooth V1.1 Core Spec. as follows:

In order to establish new connections the procedures inquiry and paging are used. The inquiry procedure enables a unit to discover which units are in range, and what their device addresses and clocks are. With the paging procedure, an actual connection can be established. Only the Bluetooth device address is required to set up a connection. Knowledge about the clock will accelerate the setup procedure. A unit that establishes a connection will carry out a page procedure and will automatically be the master of the connection.

*Bluetooth V1.1 Core Spec.* (Ex. 1017), 96.

41. The Bluetooth Inquiry procedure begins with an inquiry message that is broadcast by a source or master unit that wants to discover other Bluetooth units that are within range. The inquiry message defines whether all Bluetooth enabled devices should respond (using the general inquiry access code or GIAC) or only a particular type of device should respond to the inquiry (using a number of dedicated inquiry access codes or DIAC). A Bluetooth enabled unit or slave unit that is in a discoverable mode allows itself to be discovered by regularly entering the “inquiry scan substate” to receive inquiry messages and respond thereto.

The inquiry message broadcasted by the source does not contain any information about the source. However, it may indicate which class of devices should respond. There is one general inquiry access code (GIAC) to inquire for any Bluetooth device, and a number of dedicated inquiry access codes (DIAC) that only inquire for a certain type of devices. The inquiry access codes are derived from reserved Bluetooth device addresses and are further described in Section 4.2.1.

A unit that wants to discover other Bluetooth units enters an inquiry substate. In this substate, it continuously transmits the inquiry message (which is the ID packet, see Section 4.4.1.1 on page 55) at different hop frequencies. The inquiry hop sequence is always derived from the LAP of the GIAC. Thus, even when DIACs are used, the applied hopping sequence is generated from the GIAC LAP. A unit that allows itself to be discovered, regularly enters the inquiry scan substate to respond to inquiry messages.

*Bluetooth V1.1 Core Spec.* (Ex. 1017), 105.

42. A discoverable Bluetooth unit that receives an inquiry message responds to the inquiring Bluetooth unit with an inquiry response message, which is a Frequency Hop Synchronization (FHS) packet containing the recipient's Bluetooth device address (BD\_ADDR) and also the recipient's Class of Device.

For the inquiry operation, there is only a slave response, no master response. The master listens between inquiry messages for responses, but after reading a response, it continues to transmit inquiry messages. The slave response routine for inquiries differs completely from the slave response routine applied for pages. When the inquiry message is received in the inquiry scan substate, a response message containing the recipient's address must be returned.

*Bluetooth V1.1 Core Spec.* (Ex. 1017), 108.

43. In order to establish a Bluetooth connection with a responding Bluetooth (slave) unit, the source or master unit carries out the Page Procedure, thereby forming a piconet. *Bluetooth V1.1 Core Spec.* (Ex. 1017) at 96-104. During the Page Procedure, the master unit will assign the slave unit an active member address (AM\_ADDR) that is carried in the packet header for subsequent communications between the master and slave units. *Bluetooth V1.1 Core Spec.* (Ex. 1017), 51.

44. The Bluetooth specification also provides a Service Discovery Protocol (SDP) whereby, after establishing a communication link, a Bluetooth unit can obtain more detailed information about available services from another Bluetooth unit.

*Bluetooth V1.1 Core Spec* (Ex. 1017), 331-392. In particular, the Bluetooth specification teaches the “service discovery mechanism provides the means for client applications to discover the existence of services provided by server applications as well as the attributes of those services.” *Bluetooth V1.1 Core Spec* (Ex. 1017), 338. Further, the Bluetooth specification teaches the “attributes of a service include the type or class of service offered and the mechanism or protocol information needed to utilize the service.” *Id.*

45. Various commercially available technologies existed before the priority date of the '223 Patent to perform such device discovery and capability determination. For example, *Han* teaches “SLP (Service Location Protocol), Jini\* from Sun Microsystems, Bluetooth’s\* SDP (Service Discovery Protocol), Microsoft\*’s UPnP\* (Universal Plug and Play), etc.” *Han* (Ex. 1012), [0030].

46. Universal Plug and Play from Microsoft was used so a “universal plug and play (UPnP) device makes itself known and available for communication with other entities on a network through a set of processes-discovery, description, control, eventing, and presentation[.]” *Zintel* (Ex. 1016), 2:62-66. “Following discovery of a UPnP device, an entity can learn more about the device and its capabilities, or interact with the device, by retrieving the device’s description from a URL provided by the device in an initial discovery message.” *Zintel*, 2:67-3:4.

### **C. Media Streaming**

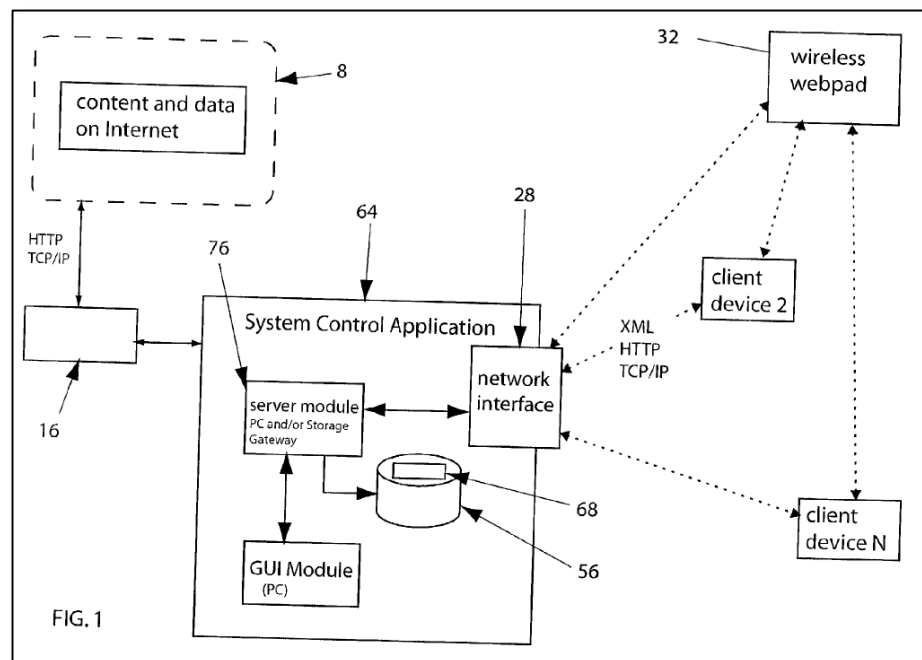
47. Streaming audio and/or video was known well before the priority date of the '223 Patent. *Hartmaier* teaches “[s]treaming audio and/or video techniques provide a method of sending the audio or video data over the Internet as a continuous, compressed stream that is played for the user on the fly as it is received. Streaming allows the user to listen to or view received information almost as soon as it is received, as compared to playing downloaded audio or video files which may have a delay of several minutes while the entire file is transferred.” *Hartmaier* (Ex. 1011), 2:17-21.

48. Further, *Hartmaier* teaches that “[s]treaming technology not only allows users to play prerecorded audio and video files, such as books, music or videos that have been digitized and stored, but also allows users to receive live audio and video in realtime.” *Hartmaier* (Ex. 1011), 2:24-26. *Hartmaier* teaches that “radio stations and television stations can stream their broadcasts over the Internet or any other computer network. Any other source of live or recorded audio or video can also be streamed to send users information or entertainment via the Internet.” *Hartmaier*, 2:26-29. *Hartmaier* also teaches that devices such as a wireless telephone can receive such streaming content. *Hartmaier*, 18:1-2 (“any analog, digital, or PCS phone without restrictions as to standard or format”), 15:23-16:19

(teaching audio streaming of sports scores to wireless telephone 101), 17:12-18

(audio streaming to wireless telephone 101).

49. *Janik* teaches an example of a mobile device receiving streaming media content over a WLAN. For example, *Janik* teaches Internet servers with media content and a PC functioning as a proxy server on a network (e.g., wireless LAN). *Janik* (Ex. 1010), [0041]-[0043]. *Janik* teaches the proxy server streams content such as audio and video from Internet servers to mobile devices such as a PDA on the WLAN. *Id.* As depicted in Fig. 1 below, *Janik* teaches content and data on Internet servers 8, which is streamed to a PC (represented by element 64), and which is further streamed to client devices including a wireless webpad (PDA) 32:



*Janik*, Fig. 1. I also note that *Janik* teaches using HTTP and TCP/IP for streaming connections between the Internet server 8, PC “64,” and client devices and wireless

webpad 32, as depicted in Fig. 1 above. *Janik*, [0007], [0030], [0036]-[0037], [0043]-[0044], [0054]-[0057], [0062]-[0063], [0081], [0084]-[0085], [0090].

50. *Han* teaches an example of streaming media from a mobile device to an end device. For example, *Han* teaches a portable device such as a PDA that streams content to a nearby output device with better capabilities, such as a TV screen or speaker. *Han* (Ex. 1012), [0032]. *Han* teaches the “user can also control which output data/stream is played/displayed on which output device, such that still images could be sent for display on the monitor of PC 36 or for outputting as hard copy at printer 38, while video images would be sent to TV 34.” *Id.*

51. In another example, *Sirota* teaches a mobile device receiving streaming radio broadcasts over a wireless network. For example, *Sirota* teaches “Client system 102 represents a broad range of digital systems known in the art, including but are not limited to devices such as wireless mobile phones, palm sized personal digital assistants, notebook computers, desktop computers, set-top boxes, and game consoles.” *Sirota* (Ex. 1029), [0026]. *Sirota* also teaches the mobile device client system 102 includes a streaming player 104 to play streaming content such as streaming radio. *Sirota*, [0025]-[0027], *see also generally Sirota*, [0014]-[0029].

#### **D. Streaming Protocols**

52. Application programs send streams of data to one of the Internet Transport Layer Protocols, either the **User Datagram Protocol (UDP)** or the

**Transmission Control Protocol (TCP).** Before the priority date of the '223 Patent, one well-known protocol used for streaming was TCP/IP.<sup>1</sup> *Egli* teaches “TCP stands for Transmission Control Protocol. TCP is one of the main protocols in TCP/IP networks. Whereas the IP protocol deals only with packets, TCP enables two hosts to establish a connection and exchange streams of data. TCP guarantees delivery of data and also guarantees that packets will be delivered in the same order in which they were sent.” *Egli* (Ex. 1015), [0022]. TCP and/or UDP receive the data stream from the sender and package them into *packets* with the destination address. The packets are sent to the next layer called Internet Network layer. The Internet Network layer packages the packet in an **Internet Protocol (IP)** datagram and sends it to a destination or gateway. Further, *Egli* teaches “TCP/IP: Stands for Transmission Control Protocol/Internet Protocol, the suite of communications protocols used to connect hosts on the Internet. TCP/IP uses several protocols, the two main ones being TCP and IP.” *Egli*, [0023].

53. Another well-known streaming protocol was UDP/IP. For example, *Bergman* teaches that one use for UDP/IP was streaming sound files:

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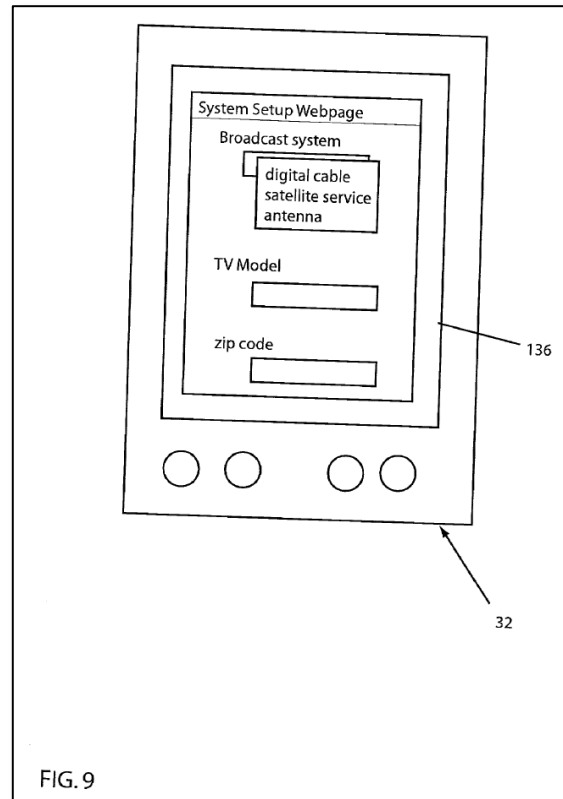
<sup>1</sup> I note that while TCP and IP are separate protocols, I refer to TCP/IP as a “protocol” for simplicity. Likewise, I refer to UDP/IP as a “protocol” rather than two separate protocols (UDP and IP) for simplicity.

On the Internet, streaming media is typically transferred or streamed to the receiving computer by a communications protocol known as UDP (User Datagram Protocol). Since IP (Internet Protocol) is packet-based, the packets are transferred in units known as datagrams. As known by those skilled in the art, UDP is a 'connectionless' protocol which uses IP to transmit datagrams while not making sure that all the packets reach their destination. This makes UDP ideal for use in applications where it is not essential for all of the packets to arrive, such as streaming sound files where the occasional lost packets do not make a noticeable difference to the listener.

*Bergman* (Ex. 1020), 4:28-5:5.

#### **E. Graphical User Interfaces (GUIs) and Touch Screens**

54. Mobile devices with graphical user interfaces, menus, and touch screens were well known before the priority date of the '223 Patent. For example, *Janik* teaches a webpad 32 (e.g., PDA) that includes a GUI to control functions of webpad 32. *Janik* (Ex. 1010), [0057]-[0059], [0062], [0079]-[0085], [0088], [0090]. *Janik* further teaches a PDA, for example, allowed a user to write on it with a stylus. *Janik*, [0026].



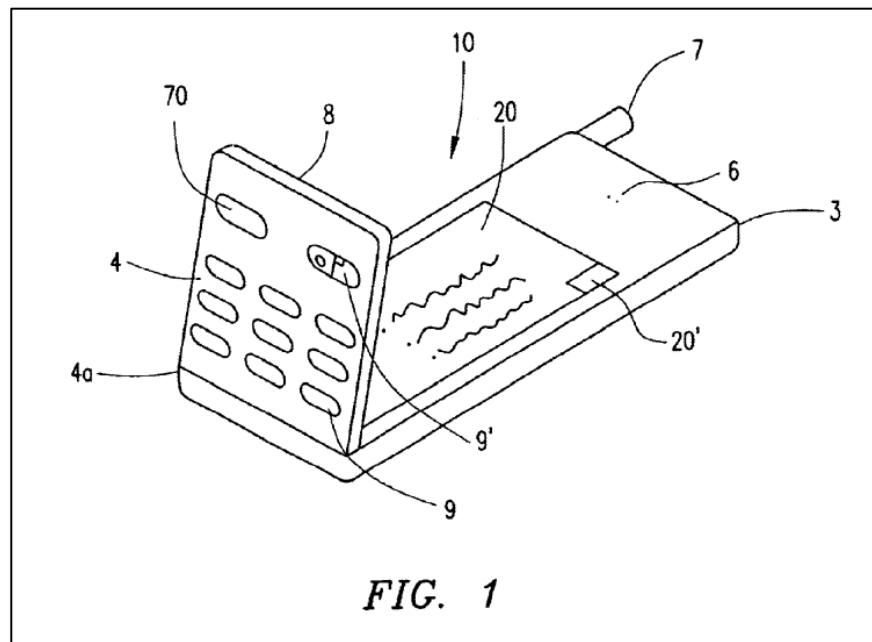
Janik, Fig. 9.

55. In another example, *Lutnaes* teaches a portable phone 10 with a touch screen display 20 for receiving commands from a user:

FIG. 1 shows a perspective view of an embodiment of a portable phone 10 according to the invention. The portable phone 10 is provided with a touch screen display 20 for displaying information such as telephone number(s), signal strength, battery level, roaming information etc, and intended for receiving commands from a user in a conventional way, as well as the inventive power-on function. The portable phone 10 has a main body 3, comprising a loudspeaker 6, an antenna 7, a microphone 8, and a flip 4, attached to the main body 3 by means of a flip hinge 4 a, and movable in relation to the main body 3, which flip 4 can be folded

up against the main body 3. The flip 4 has input means 70, for example a keypad having a plurality of keys 9, where each key 9 corresponds to a desired function. The function of each key 9 can be determined by the software of the portable phone 10. The touch screen display 20 detects which key 9 has been pushed and carries out the desired function.

*Lutnaes* (Ex. 1018), 3:53-4:6.



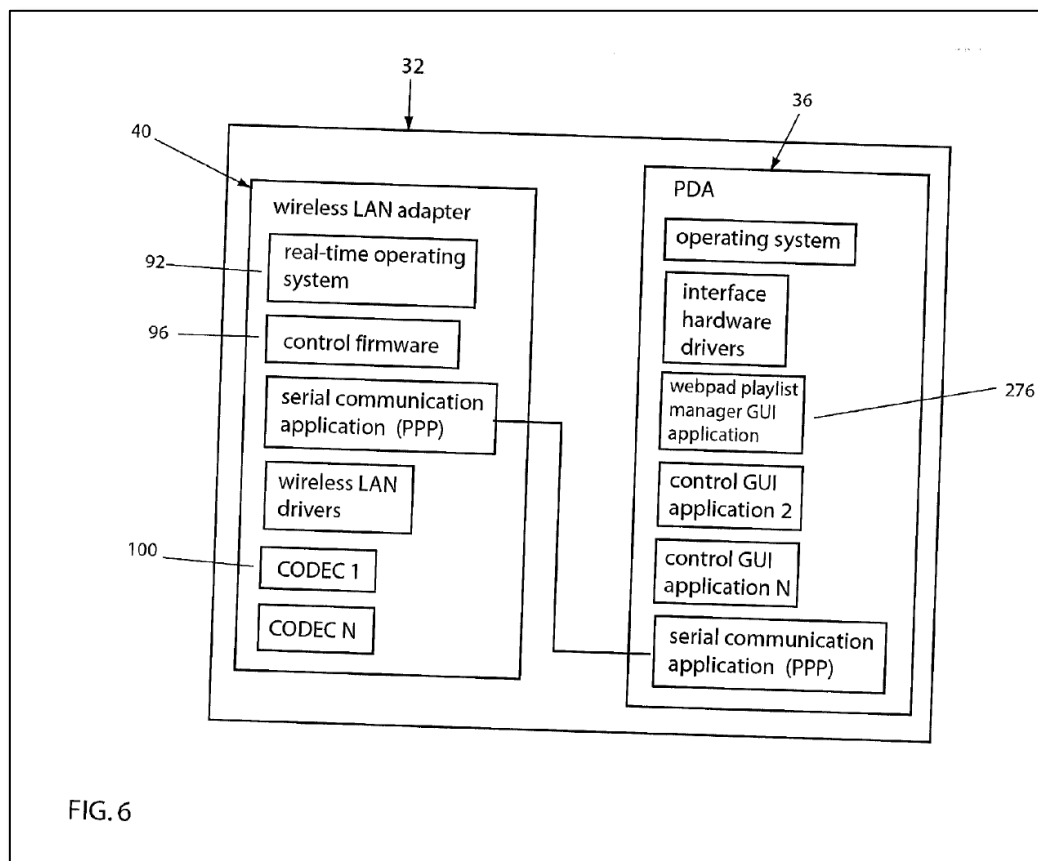
*Lutnaes*, Fig. 1.

56. In another example, *Boda* teaches a mobile phone with a touch screen. For example, *Boda* teaches a terminal device 52 that is a mobile phone with a touch screen interface 4052. *Boda* (Ex. 1019), [0076] (“In this example the terminal device 52 is a WAP- and SMS-enabled mobile phone. The mobile phone has a touch screen interface 4052 and is wireless connection 5262 e.g. to a GSM (Global System for

Mobile communication) or UMTS (Universal Mobile Telecommunication System) mobile communication network 62.”).

### F. Mobile Device Hardware

57. It was well known that mobile phones, PDAs, and other mobile devices included processors, memory, and processing instructions. For example, *Janik* teaches webpad 32 (e.g., PDA) includes a microprocessor 115 and memory such as DRAM memory 116. *Janik* (Ex. 1010), [0049]-[0051], [0053], [0059], [0063], [0078]-[0079], [0090], [0092] (teaching executing functions using the processor located in the wireless LAN adapter, the processor in the PDA, or both).



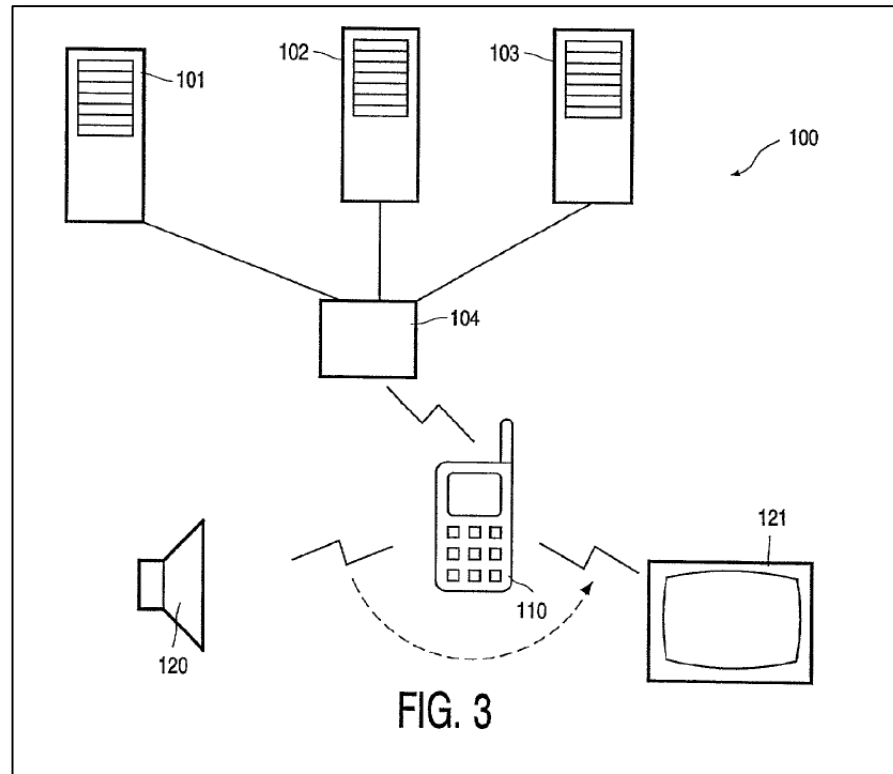
*Janik*, Fig. 6, *see also* Fig. 5.

58. It was also known to utilize hardware such as transceivers for ultra wide band (UWB) in mobile devices before the priority date of the '223 Patent. For example, *Miller* teaches “the UWB transceiver of FIG. 2 may be used as part of a local area network (LAN) connecting fixed structures or as part of a wireless personal area network (WPAN) connecting mobile devices, for example.” *Miller* (Ex. 1022), 22:4-7. Additionally, *Miller* teaches implementing such a UWB transceiver using a microprocessor system with programming instructions. *Miller*, 22:8-16 (“In any such implementation, all or a portion of the present invention may be conveniently implemented in a microprocessor system using conventional general purpose microprocessors programmed according to the teachings of the present invention[.]”), 25:34-53 (“[T]he network link 1421 may provide a connection through a PAN 1423 to a mobile device 1429 such as a personal data assistant (PDA) laptop computer, or cellular telephone.”).

#### **G. Auxiliary Rendering Devices (aka Helper Servers/Helper Devices)**

59. It was also known to utilize the capabilities of “more capable” devices for rendering audio and/or video content before the priority date of the '223 Patent. For example, *Lin* teaches a mobile device 110 that transmits content to an auxiliary rendering device 120/121 because the auxiliary device has “a rendering module 211” with “better rendering capabilities than the rendering module 203 in the mobile

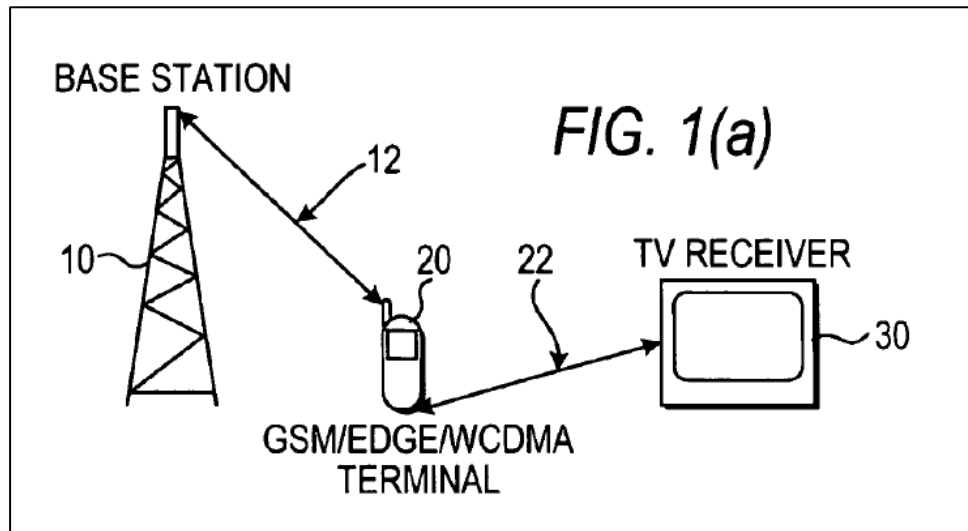
device 110.” *Lin* (Ex. 1013), [0039]. In one example, a loudspeaker is an auxiliary rendering device, which “allows rendering of audio content, such as music or speech. This way, the mobile device 110 does not need to render this audio content on its own loudspeaker, which in the case of a mobile telephone gives a much lower rendering quality compared to a dedicated loudspeaker system.” *Id.* Similarly, *Lin* teaches using an auxiliary rendering device 121 which is a display “that is bigger and has better resolution and color capabilities than the display on the mobile device 110. The mobile device 110 can now let the auxiliary rendering device 121 render visual content, such as images, text or movies, rather than render it itself on its own tiny display.” *Id.* Fig. 3 below depicts mobile device 110 as well as auxiliary rendering devices 120 and 121.



*Lin*, Fig. 3.

60. In another example, *Palin* teaches a mobile terminal (e.g., mobile phone, laptop computer, PDA) and larger external display device, where it is “particularly advantageous to enable the user to view the content, such as a video clip on a larger display, while the user is actually holding the mobile terminal, and allow the user to select what is viewed using the mobile terminal, or to otherwise use the mobile device while viewing the video clip. This would be best implemented using a wireless link between the mobile terminal and the external display.” *Palin* (Ex. 1014), 1:57-64, 2:16-25, 2:11-15 (“wirelessly linking display devices having different display capabilities to provide better display quality to a user of a mobile

terminal with an economic and efficient short range RF link.”). *Palin* teaches the content transmitted from the mobile device to the display device may be a “stream or plurality of still pictures, or graphics, or a conventional video.” *Palin*, 2:29-32.



*Palin*, Fig. 1(a).

61. In yet another example, *Mershon* teaches that wireless audio rendering devices (e.g., wireless headphones and speakers) receiving wireless signals from a portable music player were well known common helper servers. *Mershon* (Ex. 1024), 1:10-12, 1:20-28, 1:43-45. Notably, *Mershon* acknowledges that many wireless audio rendering devices were non-Internet enabled and required the use of (1) “a modular telecommunications device for an electronic unit such as a laptop computer” to “allow[] access to network, internet, and other computerized services” or (2) “a hand held communication unit including a modem [and] wireless communication” to “perform[] ... on-line data base services.” *Mershon*, 1:41-52.

## H. Codecs

62. It was also known to utilize codecs (encoder/decoder) to perform media transformations such as digital-to-analog conversion and also including audio compression transforming media from high quality to low quality to reduce bandwidth and data rate, for example. One example is *Darby*. *Darby* teaches a mobile device that includes audio and video codecs. *Darby* (Ex. 1028), [0024]. The audio and video codecs “can be selectable rate codecs to permit use of higher data rates when available or when affordable.” *Id.*

63. In another example of codecs, *Lee* teaches an MP3 player that includes a codec which “is composed of an encoder which converts analogue signals into digital signals and a decoder which converts digital signals into analogue signals.” *Lee* (Ex. 1025), 2:57-63, 1:59-61, 3:1-4 (“The decoder in codec 172 converts digital signals into analogue signals, and the consumer hears music through an earphone or a headphone plugged into the audio jack 14.”), 3:28-31 (teaching providing a codec in a cellular phone), 4:1-7.

64. In a further example of using a codec to reduce bandwidth, *Geiger* teaches a codec system may be implemented using a processor, and that the codec can perform compression and decompression. *Geiger* (Ex. 1026), Abstract (“A codec system may be designed for the reduction of data bandwidth and storage requirements and for compressing/decompressing data.”), [0009], [0013]-[0014],

[0071], [0087], [0111] (“The codec system 200 may perform memory compression and decompression ... to improve the effective data bandwidth and efficiency of system memory data transfers.”).

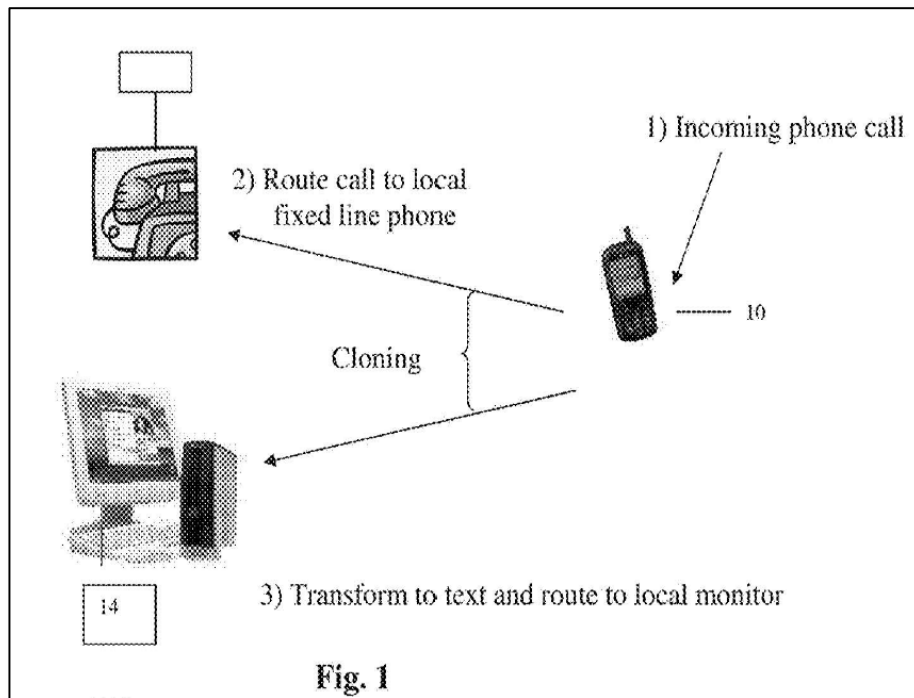
65. In another example, *Jawerth* teaches a color video codec for encoding and decoding video such as 128x117 pixel size and 10 frames per second, achieving 30-50 times compression or even up to 100 times compression or greater for some video sequences. *Jawerth* (Ex. 1027), [0044].

## **VI. OVERVIEW OF THE '223 PATENT**

66. I have reviewed the '223 Patent (Ex. 1001). Descriptions of the '223 Patent that may be pertinent to my analysis are provided below. This discussion does not represent my entire understanding of the '223 Patent.

### **A. The '223 Patent's Alleged Invention**

67. The '223 Patent is directed to streaming media (e.g., audio and/or video) communications where media streamed to a “limited capability device” (e.g., mobile phone) is routed to a “more capable device” (e.g., standalone display, speakers, etc.). '223 *Patent* (Ex. 1001), 1:20-24, 4:21-54. Fig. 1 below depicts routing an incoming phone call originally received at a mobile phone to a fixed line phone:



'223 Patent, Fig. 1. Described scenarios include routing streaming audio (e.g., music or voice calls) to a speaker and routing streaming video to a TV or computer monitor. *Id.*, 10:10-41.

### B. The '223 Patent's Prosecution

68. I have reviewed the prosecution history for the '223 Patent (Ex. 1002). Pertinent aspects of the prosecution history of the '223 Patent are described below.

69. The '223 Patent claims its earliest priority to a US provisional application filed July 25, 2002. '223 Patent, 1:7-14. I understand Apple is adopting this earliest possible priority date for purposes of the IPR, and I have been asked to assume this priority date for my analysis.

70. The Challenged Claims require a mobile device that wirelessly receives a media data stream, scans a local wireless network for a device that can handle the media data stream, selects a compatible device, sets up a wireless link with the compatible device, and routes the media data stream from the mobile device to the compatible device according to a streaming protocol such that the content can be played by the compatible device's media player. *See, e.g., '223 Patent*, Claim 1. During prosecution, the Examiner concluded that the closest prior art references—Hamberg, Mousseau, and Ortiz—failed to teach streaming media from a mobile device to compatible device according to a streaming protocol. *'223 FH*, 324 (Notice of Allowability). As I opine below, this concept was known in the prior art.

## VII. PROPOSED GROUNDS OF UNPATENTABILITY

| Proposed Grounds of Unpatentability |                                                                                                                       |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b><u>Ground 1</u></b>              | Claims 1, 5, 8, 10, 11, 14-16, 18-20, and 22 are <b>obvious</b> under § 103(a) over <i>Zhang, Moore, and Rofheart</i> |
| <b><u>Ground 2</u></b>              | Claims 7 and 13 are <b>obvious</b> under § 103(a) over <i>Zhang, Moore, Rofheart, and Thornton</i>                    |
| <b><u>Ground 3</u></b>              | Claim 9 is <b>obvious</b> under § 103(a) over <i>Zhang, Moore, Rofheart, and Liversidge</i>                           |
| <b><u>Ground 4</u></b>              | Claim 10 is <b>obvious</b> under § 103(a) over <i>Zhang, Moore, Rofheart, and Angelo</i>                              |

71. Above, I have reproduced the Proposed Grounds of Unpatentability from the Petition for ease of reference.

## VIII. OVERVIEW OF THE PRIOR ART

### A. Overview of Zhang

72. *Zhang* teaches a mobile device that can connect with and transfer media content to a network of connected helper servers (“helper environment”) to expand and improve the limited media playback capabilities of the mobile device. *Zhang*, 2:16-19. *Zhang* explains that this helper environment “supports a wide variety of capabilit[ies]... wherein the [mobile] devices remain the focus for both control and data.” *Zhang*, 2:26-30. I note that *Zhang* refers to “handheld” devices and “mobile” devices interchangeably, and a POSITA would have understood that such handheld/mobile devices were portable. *Zhang*, 1:12-18 (teaching examples of “digital handheld devices” including “Personal Digital Assistants (PDAs), cell phones, digital cameras and portable MP3 players”), 3:25-31 (teaching mobile devices include “a PDA 30 and a cellular phone 32”). Thus, a POSITA would have understood that *Zhang* refers to the same types of devices as both mobile devices and handheld devices. Additionally, I note that *Zhang* refers to devices that are “more capable” of displaying some content compared to a mobile device as “helper servers,” but *Zhang* also refers to such devices as “helper devices” and “local devices,” and uses all three such terms interchangeably. *Zhang*, 3:25-4:45, 5:58-6:44 (noting that a “helper server” is sometimes used to refer to a process running within a “helper device”), 7:1-21, 8:13-28.

73. Because *Zhang*, like the '223 Patent, discloses routing media between electronic devices, *Zhang* is in the same field of endeavor as the '223 Patent. *Compare Zhang*, 1:8-10, with '223 Patent, 1:20-24. For example, *Zhang* teaches using a helper environment for “extending the capabilities” of “handheld devices” (i.e., mobile devices) by using “nearby devices” (i.e., helper servers). *Zhang*, 1:8-10, 2:16-30, Figs. 1, 4-5, 6A-6B.

74. Further, both *Zhang* and the '223 Patent attempt to improve upon limitations with streaming media to mobile devices by re-routing media to devices with better media playback capabilities. *Compare Zhang*, 2:16-19, 3:25-31, 4:35-45, 8:13-22, 10:58-65, Figs. 1, 4-5, 6A-6B, with '223 Patent, 1:20-27, 1:33-48, 5:23-41, 9:44-51. Therefore, *Zhang* is reasonably pertinent to a problem described by the '223 Patent.

## **B. Overview of Moore**

75. *Moore* teaches a portable audio device that receives streaming audio and re-routes it to a wireless speaker. *Moore*, 1:41-2:19. Said streaming audio content or other packet data may originate from the “Web,” for example. *Moore*, 8:4-9, 8:15-18, 8:54-67. In one specific embodiment, *Moore* extracts the lower frequency components of the streamed audio signal and re-routes them to an external audio system via a wireless link to take advantage of external audio system’s larger speakers and better bass frequency (e.g., below 100 Hz) reproductions. *Moore*, 2:51-

3:34, 1:20-37, 4:47-58. *Moore* teaches that the signal transmitted from the mobile device to the external speakers can be either digital or analog. *Moore*, 5:65-6:14, Fig. 4 (including depicting DAC 84 outlined with a dotted line to show it is an optional component). In the case where an analog signal is transmitted, DAC 84 would be utilized in the mobile device to transform digital audio to an analog signal, and a similar DAC would thus not be required in the external speakers. *Id.* On the other hand, when the signal transmitted is digital, DAC 84 would not be required in the mobile device but would be utilized in the external speakers, for example, to convert the signal to analog because “it is generally necessary to convert [digital format] signal to analog format, as most types of speakers require an analog input signal to produce the desired audible output. *Moore*, 7:7-10.

76. Because *Moore*, like the '223 Patent, discloses routing media between electronic devices, *Moore* is in the same field of endeavor as the '223 Patent. *Compare Moore*, 1:6-11, 1:41-55, 2:10-18, 3:15-34, 4:21-29, 8:4-8, 8:15-25, Figs. 1, 5, *with '223 Patent*, 1:20-24.

77. Further, both *Moore* and the '223 Patent attempt to improve upon limitations with streaming media to mobile devices by re-routing media to devices with better media playback capabilities, such as external speakers. *Compare Moore*, 1:6-11, 2:51-62, 3:15-34, 8:4-8, Figs. 1, 4-5, *with '223 Patent*, 1:20-27, 1:33-48,

5:23-41, 9:44-50. Therefore, *Moore* is reasonably pertinent to a problem described by the '223 Patent.

### C. Overview of Rofheart

78. *Rofheart* teaches a local wireless network, local wireless device, and programming instructions for enabling a user to locate and select one or more of a plurality of compatible remote wireless devices, and to route data streams between the local wireless device and said one or more of a plurality of remote wireless devices. *Rofheart*, 2:4-16, 17:13-37, 14:14-15:22, Fig. 3. In particular, *Rofheart* teaches a user selects one or more devices with which to connect, and that data including audio and video can be transmitted between such devices. *Rofheart*, 26:18-23, 30:25-30, 22:51-56. *Rofheart* further teaches that the user selects remote wireless devices using a touch screen interface displaying a plurality of remote wireless devices. *Rofheart*, 18:54-58, 28:22-57, 30:10-18, Figs. 9-10. *Rofheart* also teaches storing programming instructions in non-volatile memory. *Rofheart*, Fig. 2, 13:29-65, 14:14-35.

79. Because *Rofheart*, like the '223 Patent, discloses routing media between electronic devices, *Rofheart* is in the same field of endeavor as the '223 Patent. Compare *Rofheart*, 2:4-16, 17:13-55, 26:18-23, 28:22-57, 30:25-30, Fig. 9 with '223 Patent, 1:20-24.

80. Both *Rofheart* and the '223 Patent recognize the challenges with routing streaming media between electronic devices and utilizing a user interface to select available wireless devices with which to connect. *Compare Rofheart*, 2:4-16, 17:13-55, 18:54-58, 26:18-23, 27:46-28:57, 30:25-30, Figs. 9-10 with '223 Patent, 1:20-27, 1:33-48, 5:23-41, 9:44-50. Further, both *Rofheart* and the '223 Patent recognize challenges with utilizing a user interface for a user to select available wireless devices with which to connect. *Compare Rofheart*, 18:54-58, 5:37-45, 27:46-28:38, 30:10-52, Figs. 9-10 with '223 Patent, 2:41-44, 3:22-23, 3:30-32, 8:33-37. Therefore, *Rofheart* is reasonably pertinent to a problem described by the '223 Patent.

#### **D. Overview of Thornton**

81. *Thornton* teaches routing continuous media streams (as multiple copies) from a first user across a plurality of devices simultaneously. *Thornton*, Abstract, 3:56-4:11, 9:6-9:47, 11:14-29, 5:4-54, 11:30-38.

82. Because *Thornton*, like the '223 Patent, discloses routing media between electronic devices, *Thornton* is in the same field of endeavor as the '223 Patent. *Compare Thornton*, 1:8-13, 6:26-42, 3:56-4:11, 5:4-54, Abstract, 9:6-47, 11:14-29, Fig. 1, with '223 Patent, 1:20-24.

83. Both *Thornton* and the '223 Patent recognize the challenges with routing streaming media between electronic devices and copying media data to a

plurality of copies to route to a plurality of devices. *Compare Thornton*, 1:8-13, 6:26-42, 3:56-4:11, Abstract, 9:6-47, 11:14-29, Fig. 1 *with '223 Patent*, 1:20-27, 1:33-48, 5:23-41, 9:44-50. Therefore, *Thornton* is reasonably pertinent to a problem described by the '223 Patent.

### **E. Overview of Liversidge**

84. *Liversidge* teaches that a specific user's associated "previously defined" personal profile may be created, edited, and/or deleted to "define respective communications preferences of the user" including a user's location and which devices a user prefers to communicate through at said location. *Liversidge*, [0062], [0090]-[0094], [0017], [0020], [0063]-[0065], [0070], [0076]-[0079], [0108], Fig. 1.

85. Because *Liversidge*, like the '223 Patent, discloses routing media between electronic devices, *Liversidge* is in the same field of endeavor as the '223 Patent. *Compare Liversidge*, [0003], [0017], [0020], [0062]-[0065], [0070], [0076], [0078]-[0079], [0088]-[0094], [0108], [0133], [0183], [0185], Fig. 1, *with '223 Patent*, 1:20-24.

86. Both *Liversidge* and the '223 Patent also recognize the challenges with using predetermined user profiles to carry out a selection between devices found to be available. *Compare Liversidge*, [0017], [0020], [0062]-[0065], [0070], [0076], [0078]-[0079], [0088]-[0094], [0108], [0133], [0183], [0185], Fig. 1 *with '223 Patent*, 1:20-24, 1:33-48, 3:33-35, 5:23-41, 8:33-44, 9:44-50.

## **F. Overview of Angelo**

87. *Angelo* teaches using real-time encryption to communicate the secured transmission of audio, video, or a combination of audio and video streams between portable devices. *Angelo*, Abstract, [0004], [0009]-[0010], [0014]-[0026], [0029], [0031], Figs. 3, 6.

88. Because *Angelo*, like the '223 Patent, discloses routing media between electronic devices, *Angelo* is in the same field of endeavor as the '223 Patent. *Compare Angelo*, Abstract, [0004], [0009]-[0010], [0014]-[0026], [0029], [0031], Figs. 3, 6 with '223 Patent, 1:20-24.

89. Both *Angelo* and the '223 Patent recognize the challenges with routing streaming media between electronic devices and encrypting a media data stream. *Compare Angelo*, Abstract, [0004], [0009]-[0010], [0016]-[0021], [0029], [0031] with '223 Patent, 1:20-27, 1:33-48, 5:23-41, 9:44-50, 8:14-17, 8:54-56. Therefore, *Angelo* is reasonably pertinent to a problem described by the '223 Patent.

## **IX. OPINIONS REGARDING GROUND 1: CLAIMS 1, 5, 8, 10-11, 14-16, 18-20, AND 22 ARE OBVIOUS OVER ZHANG, MOORE, AND ROFHEART**

### **A. Claim 1(Pre) - A method of routing media data stream, comprising:**

90. To the extent the preamble is limiting, *Zhang* in view of *Moore* and *Rofheart* teaches routing media data stream. *Zhang*, 8:13-29, 7:14-21; *Moore*, 4:59-64, 2:51-62. As I discuss in detail below, *Zhang* in view of *Moore* teaches a mobile

device wirelessly receiving streaming audio from a source on the Internet and re-routing that audio stream to a wireless connection to an external speaker selected by the user pursuant to *Rofheart's* teachings. *See* Claim 1(a). As in the '223 Patent, the *Zhang-Moore-Rofheart* combination improves the user experience by utilizing wireless speakers with improved capabilities compared to the limited capabilities of speakers in the mobile device. *Moore*, 2:51-3:34, 1:20-37, 4:47-58. *See* Claim 1(e).

**B. Claim 1(a) - wirelessly receiving at a mobile device, from an external source via a local wireless communication network, a media data stream transmitted according to a streaming protocol and comprising media content selected from a group consisting of: audio content and video content;**

91. *Zhang* teaches that a mobile device user can elect to play streaming media on a “helper server” with better media playback capabilities than the mobile device possesses. While *Zhang* does not expressly describe media streamed to the mobile device that is then re-routed to a helper server, this concept was known in the art. For example, *Moore* teaches a mobile device receiving a media data stream (e.g., streaming audio) from an external source (e.g., Web server) via a network such as a WLAN (e.g., utilizing IEEE 802.11 or other protocol(s)) and re-routing the streaming audio to a wireless speaker connected via the same WLAN. As set forth below, a POSITA would have been motivated to modify *Zhang* pursuant to *Moore*

to receive streaming media (e.g., audio) (*media data stream*)<sup>2</sup> from an Web server (*external source*) at *Zhang's* mobile device and reroute the streaming media to *Zhang's* helper server in the form of a wireless speaker.

**1. *Zhang's Mobile Device Discovers Helper Servers With Better Streaming Media Playback Capabilities***

92. *Zhang* teaches a mobile device that allows its user to play audio or video on a “helper server” with better media playback capabilities than the mobile device possesses. *Zhang* “provide[s] a framework in which handheld mobile devices can identify and use their environment, the devices around them, to expand their limited capabilities[.]” *Zhang*, 2:16-19, 3:25-43, 4:35-45, Fig. 1. Within the “helper environment 34[.]” a mobile device (e.g., PDA [personal digital assistant] 30, cellular phone 32, digital camera, MP3 player) “can use the devices around them to extend their limited capabilities[.]” using “helper services” offered by “helper servers[.]” including storage device 22, display device 24, printing device 26, and audio device 28. *Zhang*, 3:25-43, 4:35-38, 8:50-56.

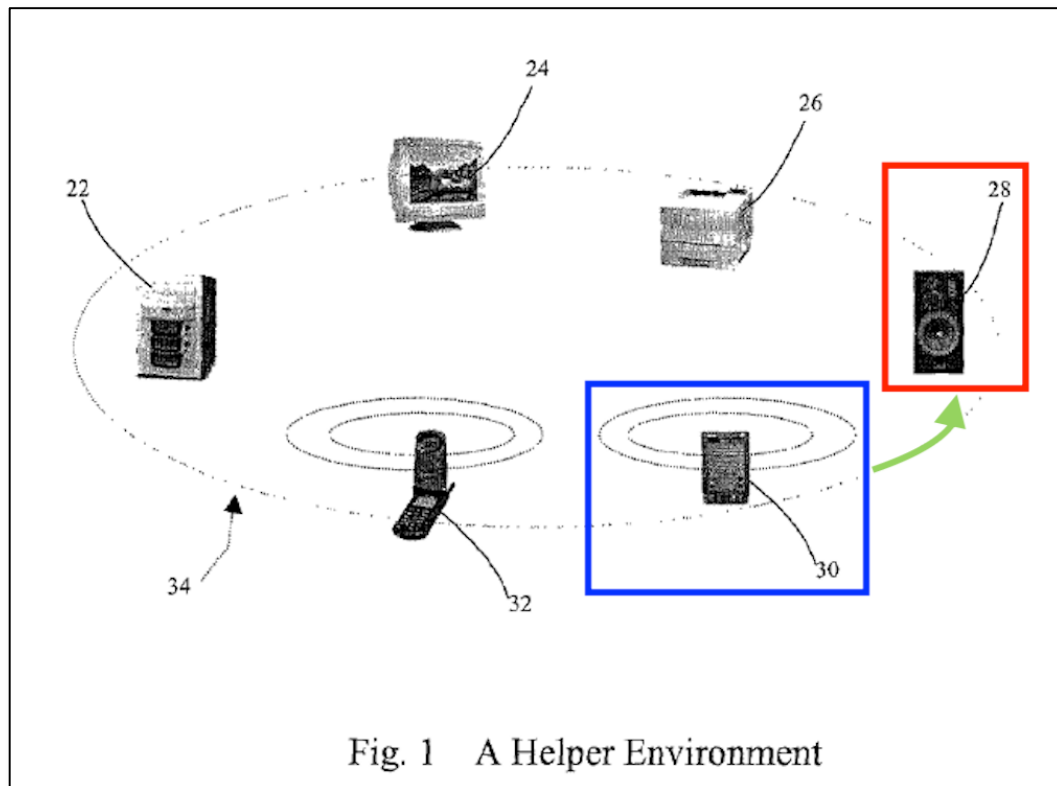
93. I note that *Zhang* refers to “handheld” devices and “mobile” devices interchangeably, and a POSITA would have understood that such handheld/mobile devices were portable. *Zhang*, 1:12-18 (including teaching examples of “digital

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<sup>2</sup> Corresponding claim language indicated with italics in parentheses.

handheld devices” including “Personal Digital Assistants (PDAs), cell phones, digital cameras and portable MP3 players”), 3:25-31 (including teaching mobile devices include “a PDA 30 and a cellular phone 32”). Thus, a POSITA would have understood that *Zhang* refers to the same types of devices as both mobile devices and handheld devices. Additionally, I note that *Zhang* refers to devices that are “more capable” of displaying some content compared to a mobile device as “helper servers,” but *Zhang* also refers to such devices as “helper devices” and “local devices,” and uses all three such terms interchangeably. *Zhang*, 3:25-4:45, 5:58-6:44 (noting that a “helper server” is sometimes used to refer to a process running within a “helper device”), 7:1-21, 8:13-28.

94. *Zhang* teaches that helper servers display/render media content including audio and/or video content, depending on which helper server(s) are utilized. *Zhang*, 3:25-43 (including teaching “audio device 28” is a helper server), 4:1-8 (teaching transferring content to a helper server), 4:32-45. I also note that a POSITA would have understood that *Zhang*’s helper servers include audio device 28 (e.g., a wireless speaker) for rendering audio content. For example, *Zhang*’s Fig. 1 (annotated as in the Petition) highlights an exemplary scenario in which *Zhang*’s PDA 30 (blue) uses wireless speaker 28 (red) to play streaming audio via wireless network 34 (green, in relevant part):



*Zhang*, annotated Fig. 1.

95. I note that while *Zhang* does not expressly use the word speaker, a POSITA would have understood that a wireless speaker would have been a common prior art audio device for rendering audio content via a wireless network. For example, see Section V.G (discussing *Lin* and *Mershon*). Additionally, a POSITA would have understood that *Zhang's* Fig. 1 depicts such a wireless speaker as an example of audio device 28.

## 2. *Wirelessly Receiving From an External Source*

### a) *Zhang-Moore Overview*

96. *Zhang* expressly teaches streaming media on a helper server and using the mobile device to control the stream. *Zhang*, 8:13-29 (“[W]hen the user data is displayed on the helper server, the user can use the handheld device . . . to remotely control the display of the data” and, “for **streaming** data, the user may issue ‘stop’, ‘resume’ and ‘fast forward’ commands to the server.”). *Zhang* also teaches that media played on a helper server can be in the form of “**actual data** or a URL to the data.” *Zhang*, 7:14. Although *Zhang* teaches that it may be more efficient for the helper server to retrieve streaming content from the web by processing a URL, non-Internet enabled<sup>3</sup> helper servers are not capable of processing URLs and must instead receive streaming data from a device on the local wireless network. See Section V.G (discussing *Mershon*). *Zhang*, 7:14-21. Therefore, streaming data from the mobile device to a helper server provides greater choice of helper servers, improving the capabilities of *Zhang*’s system. Indeed, a POSITA would have understood there would have been a tradeoff involved in not using a URL because while using a URL may be more efficient, doing so excludes non-Internet enabled devices, which

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<sup>3</sup> “Non-Internet enabled device” is understood to mean a device lacking the hardware and/or software necessary to directly retrieve content from Internet-based services (e.g., Web servers), but can still utilize a wireless local area network to share resources and communicate with other devices.

cannot retrieve content via a URL on their own. Thus, a POSITA would have been motivated to rely on *Zhang's* teaching of transmitting “actual data” from the mobile device to the helper server to advantageously utilize non-Internet enabled devices, including wireless speakers, as helper servers. In this manner, streaming data from the mobile device to a helper server provides greater choice of helper servers, improving the capabilities of *Zhang's* system. As set forth below in detail, a POSITA would have been motivated to modify *Zhang* pursuant to *Moore* to receive streaming media (e.g., audio) from an external source (e.g., a Web server) at a mobile device and reroute the streaming media to a helper server (e.g., a wireless speaker). *See* Section IX.B.5.

**b) *Moore* Teaches Streaming Audio From Web Server to Mobile Device and Routing That Audio to a Wireless Speaker**

97. *Moore* teaches audio playback system 10 including portable audio device 12 and external audio system 14. In one embodiment, portable audio device 12 splits out the bass components of a streaming audio signal and sends at least this low frequency audio signal “to the external audio system 14 over wireless link 16.” *Moore*, 4:59-64 (referring to the bass component as an “enhancement signal”); *see also id.*, 2:51-62 (explaining that the primary audio is played via speakers 22 of portable device 12 while a second audible signal (i.e., the low frequency bass components) are played via speakers 32 of external audio system 14). A POSITA

would have understood that *Moore* also contemplates sending the entire audio content signal to the external audio system's speakers. Indeed, I note that *Moore* expressly teaches routing “*at least* the lower-frequency components” from a mobile device lacking the “frequency range of full-size speakers” to an “audio system[] employing full-size speakers” to produce “*full range* sound” to improve the streaming audio playback experience. *Moore*, 1:25-26, 1:41-44, 3:4-24. A POSITA would have understood from *Moore*'s teachings that either the low frequency sounds may be transmitted to a helper server or the entire audio may be transmitted to a helper server to produce such full range sound using more capable speakers than those in the mobile device. Thus, a POSITA would have understood *Moore*'s teachings are not limited to sending only the lower (bass) frequencies to an external speaker.

98. *Moore* teaches routing a media data stream such as streaming audio from a Web server to a mobile device. For example, *Moore* teaches “the portable device 12 can receive data, such as streaming audio from the Web for local playback through wireless link 16, while simultaneously sending its enhancement signal to audio system 14 for playback enhancement.” *Moore*, 8:4-8, 8:15-25 (describing “receipt of streaming audio or other media content from the Web”). Indeed, *Moore* teaches a wireless gateway 90 that “may be used to route Web or other packet data traffic to and from the portable audio device 12[.]” *Moore*, 8:54-67, 2:10-18. Thus,

a POSITA would have understood that *Moore* teaches a mobile device receiving streaming audio or other such media content from the Web.

99. While some embodiments use a Bluetooth wireless connection between portable audio device 12, audio system 14, and wireless gateway 90, *Moore* also expressly teaches using WLAN (e.g., implemented using the IEEE 802.11b standard). *Moore*, 7:19-25, Abstract. A POSITA would have understood that WLAN (for example, implemented using the IEEE 802.11b standard) would have been a suitable network for streaming media such as audio instead of using a Bluetooth network connection for said streaming. Indeed, it was well known that Web servers and other devices provided streaming media content to a mobile device over wireless networks including a WLAN. For example, *Janik* teaches such well known media content streaming over WLAN from an Internet server to a device connected to a WLAN, such as a computer. *See* Section V.C (where I opine on *Hartmeier*, *Janik*, and *Han*'s teachings regarding streaming media over a network such as WLAN).

100. A POSITA would have understood that the Web server described by *Moore* is an "external source," as claimed, at least because such a Web server is external to the mobile device. *Moore*, 8:36-53, Fig. 5. Indeed, a Web server and a mobile device are two separate devices, and thus a POSITA would have understood that a Web server is an external source that is not physically part of the mobile device. Additionally, as I discussed above, a Web server was a well-known device

for transmitting streaming media content to a device, including to a mobile device.

*See* Section V.C (opining regarding *Hartmeier*, *Janik*, and *Han*).

### **3. *Streaming ... According to Said Streaming Protocol***

101. I note that neither the '223 Patent specification nor the '223 Patent File History provides express examples of a “streaming protocol.” *See* '223 Patent; '223 Patent FH. As I set forth below, a POSITA would consider TCP/IP (and UDP/IP) streaming protocols within the broad meaning ascribed by the '223 Patent. However, if Patent Owner argues that a lower-level streaming protocol is required, a POSITA would have understood that many such protocols existed and were well known, and a POSITA would have been motivated to utilize a specific streaming protocol rather than or in addition to TCP/IP or UDP/IP).

102. *Zhang*'s “framework” connects devices using a Wireless Local Access Network (WLAN) (via IEEE 802.11 or HomeRF wireless networking standards) and communicates media using Transmission Control Protocol/Internet Protocol (TCP/IP) communication protocols. *Zhang*, 5:65-6:9, 6:21-23. *Zhang* also teaches that UDP/IP can be used instead of TCP/IP. *Zhang*, 9:51-10:7, 5:29-32. A POSITA would have understood that TCP/IP and UDP/IP are both streaming protocols and would have been motivated to stream media content in *Zhang*'s system according to either TCP/IP or UDP/IP because such protocols were well known, widely used, industry standard protocols and were both used for streaming media. Indeed, I

opined above regarding *Janik* (Ex. 1010) teaching TCP/IP is a streaming protocol.

*See* Sections V.C-V.D.

103. Notably, streaming media content according to a streaming protocol was the alleged point of novelty missing from the asserted claims prior to allowance. '223 *FH*, 324-25. As noted by the Examiner, none of *Hamberg*, *Mousseau*, or *Ortiz* (cited prior art references) disclose using a streaming protocol, whereas *Zhang* expressly discloses two suitable streaming protocols. '223 *FH*, 324-25; *Zhang*, 5:29-32. Indeed, *Zhang* expressly teaches either of TCP/IP or UDP/IP is a suitable protocol for streaming data. *Zhang*, 5:29-31 (expressly listing UDP/TCP, which a POSITA would have understood as UDP/IP or TCP/IP), 5:65-6:9, 6:21-23, 7:3-6, 8:4-6, 9:51-10:3, 10:4-7 (expressly teaching using UDP[/IP]). A POSITA would have understood that because *Zhang* expressly teaches both TCP/IP and UDP/IP are suitable options, either would have been a suitable choice for a streaming protocol for *Zhang's* WLAN. Indeed, a POSITA would have understood that TCP/IP is advantageous for maintaining packet order and providing retransmission and that UDP/IP would have been advantageous in situations where retransmission is not necessary but speed is prioritized. *See* Section V.D where I opine on streaming protocol background.

#### **4. *Streaming Media Content***

104. *Zhang* teaches that a mobile device transmits actual data or a URL to a helper server. *Zhang*, 7:1-13 (noting the mobile device sends the helper server “a flag indicating whether the actual data or a URL will follow”), 8:16-18 (“streaming data”), 10:58-65 (“video streams”). In the proposed combination, *Zhang*’s mobile device receives streaming audio from a Web-based source (e.g., retrieved via a URL) and re-routes all or some of that audio to a helper server (e.g., wireless speaker). For example, *Zhang*’s mobile device would receive streaming audio from a Web server, per *Moore*’s teachings, and then reroute at least the bass portion (lower frequencies) of the streaming audio (or the entire audio signal) to an external audio system that has better music reproduction capabilities than the mobile device.

##### **5. *Motivation to Combine Zhang and Moore***

105. A POSITA would have been motivated to modify *Zhang*’s mobile device according to *Moore*’s teachings (1) to receive an audio stream from an external source (e.g., Web server) via a local wireless communication network (e.g., WLAN) and (2) to reroute some or all of that audio stream to a helper server (e.g., wireless speaker(s)) via the same local wireless communication network (e.g., WLAN). Indeed, such a modification would have advantageously rerouted streaming audio to a more capable helper server such as an external audio system, which can reproduce the audio with a fuller range of sound than the speakers in a mobile device. As discussed above, *Zhang* teaches streaming media in a helper

environment including sending “actual data” from a mobile device to a helper server, but does not expressly describe routing a media stream *from an external source through* the mobile device to a helper server. *Moore* teaches a similar mobile device that receives streaming audio from an external source (e.g., Web server) over a WLAN and reroutes at least part of that audio stream through the mobile device and over the WLAN to a helper speaker. *Moore*, 2:10-19, 8:4-25, 8:54-67, 7:19-25.

106. Modifying *Zhang* as proposed would have advantageously expanded the types of helper servers compatible with *Zhang*’s system, allowing *Zhang*’s mobile device to receive streaming media (e.g., audio) and reroute all or part of said stream to non-Internet enabled helper servers (e.g., wireless speaker(s)). Importantly, such a modification would have allowed non-Internet enabled devices to receive streaming audio from a mobile device rather than using a URL with Internet-enabled helper servers. Indeed, it was well known in the prior art that many wireless audio devices such as wireless speakers or headphones required a local device to retrieve content from a Web server because the wireless speakers/headphones did not include hardware or otherwise had limited processing capabilities to pull content directly from a Web server using a URL. *Mershon* teaches such, as I discussed above. *See* Section V.G. (*Mershon* teaches wireless speakers that must remain in range of a local wireless audio source because said speakers cannot directly stream audio from the Web). A POSITA would have understood that

non-Internet enabled wireless speakers were widely available and would have appreciated the value in permitting their use, rather than limiting *Zhang's* system to speakers with more sophisticated (and expensive) capabilities of processing URLs and retrieving audio content directly from the Web (Internet-enabled speakers). Indeed, even though processing a URL at the helper server might be more efficient than using the mobile device as a streaming audio pass through (e.g., by decreasing the overall data communicated over the WLAN), a POSITA would have understood that many users would be willing to accept the lower efficiency in exchange for a larger selection of audio helper servers.

107. Additionally, modifying *Zhang's* mobile device to retrieve audio content by streaming from a Web server would have beneficially avoided the need to store large amounts of content on the mobile device's local memory. A POSITA would have understood such because streaming media requires temporarily storing only a portion of a given media content (e.g., a portion of an audio stream rather than an entire audio file) in local memory (e.g., caching), rather than storing the entire content in the mobile device's memory. *Zhang* expressly recognizes that some mobile devices used in its system have "very small memory size" and cannot store large media files internally for playback. *Zhang*, 7:14-21. Accordingly, a POSITA would have understood that streaming to the mobile device and rerouting some or all of the media to a helper server, as taught by *Moore*, avoids the need to store large

media files locally on the mobile device, thereby minimizing the small memory concerns identified by *Zhang*. Additionally, streaming to the mobile device and then from the mobile device to the helper server would have advantageously captured the advantages discussed above, including providing non-Internet enabled helper servers to which to stream audio or other media content.

108. Modifying *Zhang* according to *Moore's* teachings would also have advantageously provided the user more control over what content is streamed to a helper server. Indeed, such a modification would have allowed a user to pick particular content to be streamed to a helper server rather than sending only a URL or always sending the entire content. As described above, *Moore* teaches a user can choose to extract low frequencies from an audio stream and send those to an external speaker, while retaining the mid- and high-frequencies for playback on the mobile device speakers. *Moore*, 3:4-34. A POSITA would have understood that *Moore* also teaches sending an entire audio signal, such that a user would have the ability to choose to transmit an entire audio stream to external speakers, if desired. A POSITA would have understood that in some situations such would be desirable, such as when a user wants to utilize a set of external speakers, rather than a single speaker. A POSITA would also have understood that enabling such control is most effectively and efficiently realized by streaming a master media stream first to the mobile device, and then rerouting some—or all—of that media stream to a helper server, as

*Moore* expressly teaches. *Id.* Therefore, POSITA would have understood that providing such user control would have been use of a known technique of selecting portions (or all) of a stream of media content to a helper server to improve *Zhang*'s system in the same way as *Moore*'s.

109. A POSITA would have understood that the helper server retrieving a media stream directly from a Web source (e.g., via a URL) would limit the user's ability to exercise control that *Moore*'s arrangement provides—retaining some media for playback on the mobile device. I note that *Zhang* teaches an embodiment where a helper server retrieves content from the Web using a URL and that this embodiment is described as more efficient than using the mobile device as a pass-through device that sends “actual data.” *Zhang*, 7:1-21. However, while some efficiency may be lost with the proposed modification, a POSITA would have understood that modifying *Zhang*'s system as proposed would have been a tradeoff to advantageously provide a user greater control of what media is played at the helper server and/or at the mobile device.

110. Further supporting the motivation to combine these references, as set forth in detail above, *Moore* and *Zhang* describe similar systems. I note that both describe mobile devices invoking the extended capabilities of helper servers and both describe utilizing those helper servers to improve a media playback experience. Given these similarities, a POSITA would have recognized that the benefits realized

by *Moore* would have been applicable to *Zhang* as well. Indeed, both *Zhang* and *Moore* teach similar mobile devices (e.g., mobile phones, PDAs) and helper servers (e.g., audio devices).

111. Finally, a POSITA would have had a reasonable expectation of success in modifying *Zhang* according to *Moore*'s teachings. I note that such a modification would have utilized *Zhang*'s mobile device which already has wireless capability, and which already connects to other devices via WLAN. Specifically, *Zhang* teaches using a networking protocol/standard such as IEEE 802.11 or HomeRF for the WLAN and communication protocols such as TCP/IP or UDP/IP. *Zhang*, 4:42-58. Although a POSITA would have understood that *Zhang*'s mobile device was capable of connecting to a Web server to retrieve streaming media content, *Zhang* is silent regarding said function. Indeed, *Zhang* does not provide an express teaching that its mobile device retrieves streaming content from the Web even though such was well known in the prior art, as I discussed above. See Sections V.C-V.D. However, a POSITA would have understood that *Moore*'s express teachings of wirelessly connecting a mobile device and a Web server would have made implementing *Moore*'s teachings using *Zhang*'s mobile device a simple, straightforward modification well within the skillset of a POSITA. Indeed, a POSITA would have understood that *Zhang*'s mobile device (such as a mobile phone) would already have had the necessary hardware and software instructions to connect to an external

server. Further, I note that *Janik* teaches streaming content from an Internet server to a mobile device, such that the functionality was well known in the prior art. A POSITA would also have expected success based on the similarities between the mobile devices—both in structure and in function—described by *Zhang* and *Moore*. Both *Zhang* and *Moore* teach mobile devices such as PDAs or mobile phones, contemplate WLAN connectivity using mobile devices and helper servers, and contemplate streaming media.

**C. Claim 1(b): scanning said local wireless communication network using said mobile device to identify a plurality of devices, identified as compatible to handle said media content, said plurality of devices are wirelessly connected to said local wireless communication network and wirelessly announce an availability for accepting a routed media via said local wireless communication network;**

***1. Zhang's Teachings – Scanning and Identifying Compatible Devices to Handle Media Content***

112. As discussed above, *Zhang* teaches that a plurality of helper servers (e.g., audio device 28) (*plurality of devices*) are connected to the framework (via a WLAN using IEEE 802.11 or HomeRF) (*local wireless communication network*). See Claim 1(Pre)-1(a); *Zhang*, 3:25-43, 4:35-50. The helper servers are a plurality of devices wirelessly connected to the local wireless network, as claimed. Also discussed above, *Zhang* in view of *Moore* teaches a mobile device that wirelessly receives a media data stream from an external source via a local wireless communication network. See Claim 1(a). Further, *Zhang-Moore* teaches a mobile

device that utilizes helper services of helper servers for playing audio content. *See* Claim 1(a), 1(e).

113. To utilize the “helper services,” provided by *Zhang*’s “helper servers,” *Zhang* teaches that a mobile device that scans the framework to locate a nearby helper server that “is capable of displaying the content.” *Zhang*, 3:32-43. *Zhang*’s mobile device performs the following key steps:

(1) ***Device discovery***: The handheld device identifies the nearby helper servers.

(2) ***Service query***: The handheld device queries the identified helper servers to determine if they are capable of providing the helper service.

(3) ***Request transfer***: The handheld device selects a helper server and delegates the task to it.

(4) ***Remote control***: The helper server returns a remote control interface description to the handheld device.

*Zhang*, 3:44-56, 6:40-44. *Zhang*’s mobile device performs (1) “device discovery,” scanning the wireless network to identify nearby helper servers, and (2) a “service query” where the mobile device queries the identified helper servers to see if said servers are capable of providing a particular desired helper service. Then, (3) the helper servers announce to the mobile device their availability to perform the requested helper service (e.g., whether the helper server is currently busy). Regarding performing device discovery and service query, *Zhang* teaches the mobile device “identifies the nearby helper servers” and “determine[s] if they are capable

of providing the helper service” that the mobile device requests. *Zhang*, 3:25-64, 4:1-5, 4:35-45. *Zhang* teaches that the service request includes “the MIME type of the user data, the requested service on the data (e.g. displaying, printing or storing), a flag indicating whether the actual data or a URL will follow, the length of the data in bytes, the expected duration of the service, and optionally, authentication information.” *Zhang*, 7:1-13. I note that the MIME type for data indicates a type of data such as images, audio, or video. For example, image/jpg, image/gif, audio/mpeg, audio/wav, video/quicktime, and video/x-ms-video (AVI) are examples of MIME types that indicate a type of data (e.g., audio, video, image) and a particular format (e.g., wav, quicktime, jpg). *See Egli* (Ex. 1015), [0101], [0107]-[0108]; *Zintel* (Ex. 1016), 56:6 (“<mime type=“image/jpeg”/>”), 59:53 (“<mimetype>image/format</mimetype>”).

114. Thus, *Zhang* teaches that a mobile device “determine[s] whether there is a helper server in its environment that can fulfill the requested task.” *Zhang*, 6:35-40, 6:40-44 (“To achieve this, three steps are actually involved: (1) locating nearby devices, (2) querying these devices about the existence of requested helper services[.]”). I note that the third step referred to in the previous quotation (*Zhang*, 6:40-44) is discussed below. A POSITA would have understood that such locating and querying teaches or at least renders obvious identifying a helper server compatible to handle media content. Indeed, performing locating and querying

identifies a helper server that is compatible to handle rendering media content such as audio, video, text and/or images because the helper server indicates helper services that it offers.

**2. *Zhang Teaches Helper Servers Wirelessly Announce Their Availability***

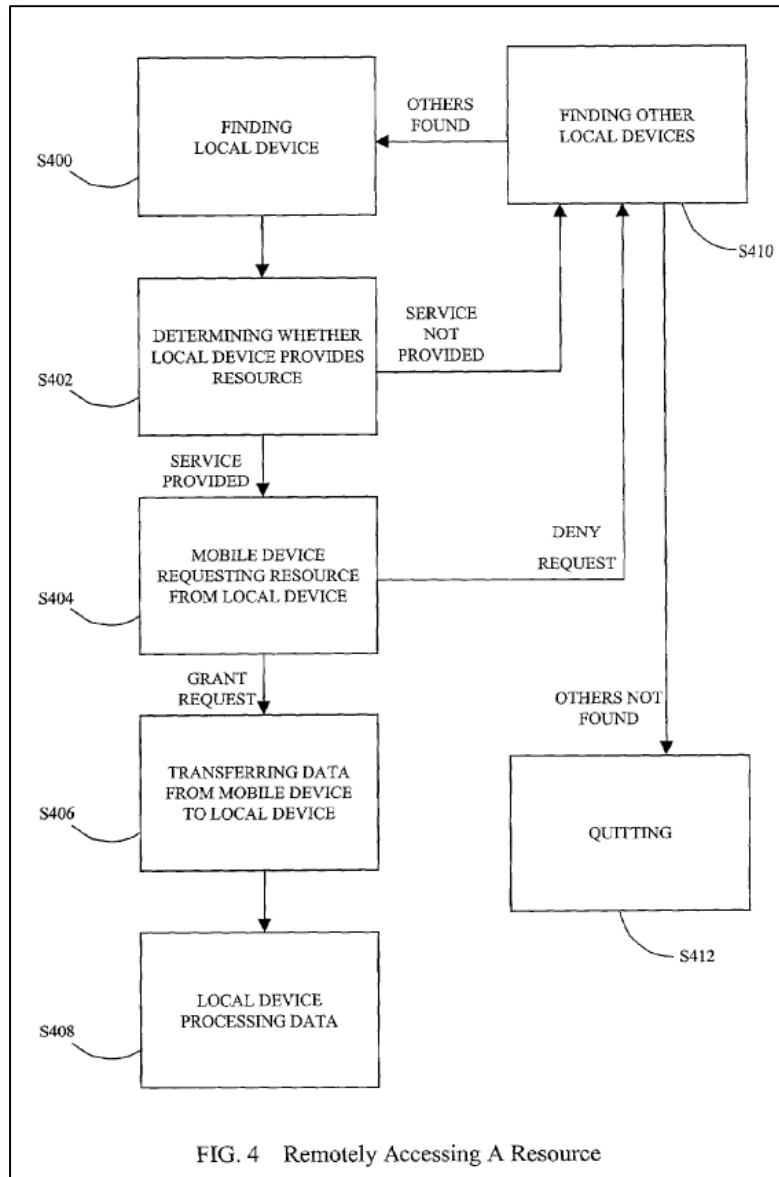
115. In *Zhang's* third step, "request transfer," a helper server responds to the service query, indicating its *availability* to handle the requested service. Specifically, in response to the service query, the helper "server makes the admission decision S648 and informs the client whether its service request can be granted right away, has to be queued[,] or is denied (e.g. not enough total resource on the server or authentication failure) S646." *Zhang*, 7:22-25, 7:58-60 ("Once a service request is accepted by a helper server S650, the client is notified S610 and can start transferring service data to the server S612."). A POSITA would have understood that, when *Zhang's* system is implemented via WLAN, its device discovery is done via the network connection over the WLAN (*wirelessly announce an availability for accepting a routed media via said local wireless communication network*). A POSITA would have understood that, when *Zhang's* system is implemented via WLAN, such informing is done via the network connection over the WLAN. This is because the devices are connected in a wireless network "framework" such as a WLAN, and the devices utilize this wireless network to communicate with each

other. Thus, when implementing *Zhang* using WLAN, the communication between the mobile device and helper server(s) would be via the WLAN as well.

116. Whether the request is temporarily queued or granted “right away,” *Zhang*’s servers announce their availability, as claimed. Starting with the queued example, *Zhang* teaches an embodiment where a compatible helper server is currently busy, such that the mobile device’s request enters a queue, and the user is informed of the helper service availability. *Zhang*, 4:24-31, 6:6-20 (teaching a helper client 92 process running on mobile device 114 that “handles all helper requests 112 on the handheld device 114 by forwarding them to a selected helper server 94, ***notifies the user about service availability for queued requests[.]***”), 6:21-34, 7:22-33 (“when the request has to be queued, ***the client will be notified at a later point when the service becomes available***”), Figs. 5, 6A-6B. By notifying a user about the service availability, such as for a queued request, the user is informed of whether the helper server is currently busy and unavailable. Similarly, if a helper server does not inform a user that it is unavailable, the service request may be granted “right away,” which announces to the mobile device that the helper server is available to perform a helper service. A POSITA would have understood this announcement of availability (or unavailability) is initially sent by the server and is subsequently conveyed to the user by the mobile device. Thus, a POSITA would have understood

that a helper server wirelessly announces its availability to the mobile device (and the user).

117. Where a request can be granted right away, the queueing of Fig. 5 is skipped and the helper server's availability is announced immediately. A POSITA would have understood such because if there is no queueing required, the request is granted "right away," as discussed above. Fig. 4 (below) depicts the process through which *Zhang's* mobile device discovers a nearby helper server (S400), ascertains said helper server's capabilities (S402), transfers data to the helper server (S406), and where said helper server processes/plays said data (S408). A POSITA would have understood and found obvious that the helper server responding with its availability to service the request meets the claimed, "wirelessly announce an availability for accepting a routed media ...[.]" Indeed, a POSITA would have understood from *Zhang's* teachings that a helper server responding with its availability for servicing a service request of a mobile device would have been wirelessly announcing (via the framework, such as WLAN) its availability for accepting routed media (performing the service request, including rendering audio or video media).



Zhang, Fig. 4, 3:44-4:8 (describing the same and noting the mobile device can remotely control data playback); see also Fig. 5 (also shows the steps of Fig. 4 but includes steps for queueing a request if the helper service is not currently available). I note that Fig. 4 includes steps of finding local device (helper server) at S400, determining whether the helper server provides a resource at S402, and if the service

is provided, the mobile device requests the resource from the helper server (e.g., requests rendering audio or video at the helper server) at S404, and if the request is granted, the data is transferred from the mobile device to the helper server at S406, and then the helper server processes the data at S408. There are additional steps in the flowchart of Fig. 4, including if a helper server does not provide a service then other helper servers are located (S410), as well as if a request is denied at S404 then another helper server is located at S410. Fig. 5 is similar, but also includes queueing functionality where a helper server is not currently available but can service a request in the future.

118. *Zhang* also teaches identifying a plurality of helper servers. For example, step S410 “finding other local devices” occurs if the result of step S402 “determining whether local device provides resource[s]” is “service not provided” or if step S404 for requesting resources results in the request being denied. *Zhang*, Fig. 4, 3:61-4:8, Fig. 5. Therefore, *Zhang*’s process of identifying a plurality of helper servers occurs sequentially if a first device is either incompatible or unavailable. A POSITA would have understood that such process would have occurred sequentially because the flowcharts depicted in Figs. 4 and 5 use loops to search for a new helper server if a helper server does not offer a requested helper service or for when a helper server is unavailable to service a request (e.g., denies a request). However, *Rofheart*, described below, teaches simultaneously identifying a

plurality of compatible devices with which to connect to transfer data, video, and/or audio. To the extent the PO argues *Zhang*'s sequential identification of a plurality of devices does not "identify a plurality of devices," it would have been obvious to modify *Zhang* pursuant to *Rofheart* to simultaneously identify helper servers.

### **3. *Rofheart Teaches Locating Multiple Helper Devices***

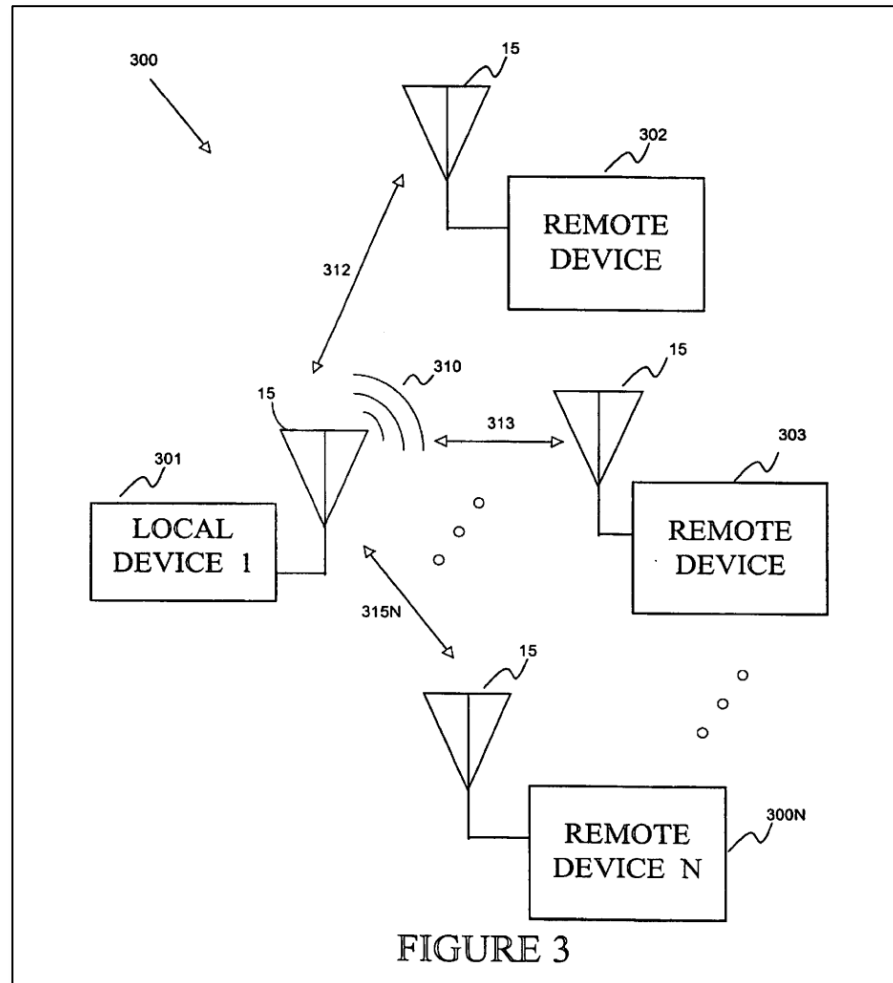
119. *Rofheart* acknowledges that "the recent proliferation of hand held computers has made data exchange between wireless devices ... more common." *Rofheart*, 2:10-12. To improve communications between the growing number of wireless devices, *Rofheart* teaches locating a plurality of devices over a local wireless communication network and a user selecting one or more devices to connect to for transmitting data (e.g., audio, video). *Rofheart*, 2:4-16, 4:61-63, Figs. 9-10. Specifically, *Rofheart* teaches a local wireless network that carries data streams between wireless devices. *Rofheart*, 2:4-16 ("The present invention relates generally to ... enabling communications functions in a local wireless device based on a distance between the local wireless device and a remote wireless device.")<sup>4</sup>, 15:53-

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<sup>4</sup> I note that *Zhang* uses "local device" to indicate a device remote from the handheld/mobile device, such as a "helper server." See ¶¶72, 93. *Rofheart* uses "local wireless device" synonymously with *Zhang*'s handheld/mobile device (e.g., PDA). *Rofheart*, 3:61-4:63, 19:1-20:62, 26:40-27:36, 28:22-63.

55 (“The LAN/PAN communications network 223 and IP network 227 both use electrical, electromagnetic or optical signals that carry digital data streams.”).

120. *Rofheart* teaches a local area network (LAN) or personal area network (PAN) implemented using ultra-wide band (UWB) technology. *Rofheart*, 15:23-63; 17:13-18 (teaching wireless network 300 “may be WPAN [wireless PAN], WLAN, or some other wireless network”). I note that *Rofheart* teaches utilizing a wireless network 300 such as a WLAN and that a particular technology such as UWB is also implemented for use with the WLAN. Indeed, *Rofheart* expressly contemplates using WLAN as one of a number of suitable networks and *Rofheart* expressly contemplates utilizing UWB because of its benefits, including precision “resolution” for locating nearby wireless devices with which to connect. *Rofheart*, 7:1-12 (teaching “resolution” for locating nearby wireless devices from mere centimeters up to 1 meter away). *Rofheart* further teaches that its wireless network 300 includes local device 301 that is linked to first remote device 302, second remote device 303, and N number of additional remote devices 300N “via UWB links 312, 313, and 315N respectively.” *Rofheart*, 17:18-22. *Rofheart* teaches that the local and remote devices include hardware for such communications links, including a processor system, UWB transceiver and antenna. *Rofheart*, 17:38-55. Fig. 3 below depicts wireless network 300:



*Rofheart*, Fig. 3. The UWB links are “full duplex communications links that carry data, voice, video, or any other analog or digital information in accordance with the present invention.” *Rofheart*, 17:22-25.

121. In *Rofheart*, each of wireless devices 301 through 300N “may be . . . a mobile telephone, a laptop computer or personal digital assistant (PDA)[.]” *Rofheart*, 17:25-30, 15:50-55. In one embodiment, *Rofheart*’s local and remote devices are PDAs. *Rofheart*, 26:42-46. In another embodiment, the local device (e.g., local mobile device 901) is a PDA or other mobile device (e.g., laptop, cellular

telephone) and the remote devices may be either mobile or stationary. *Rofheart*, 27:46-64, 28:39-57, 2:10-12. Accordingly, *Rofheart*, as exemplified by Fig. 3 above, and Fig. 9 below (*see* Claim 1(c)), teaches that a local device identifies and connects with a plurality of remote devices, such as wireless devices 301 through 300N.

#### **4. Motivation to Combine Zhang, Moore, and Rofheart**

122. A POSITA would have been motivated and found it obvious to modify *Zhang* according to *Rofheart*'s teachings such that *Zhang-Moore-Rofheart* would have identified a plurality of devices compatible to handle *Zhang-Moore*'s media content.

123. A POSITA, acknowledging the proliferation of wireless devices, would have recognized the benefit of providing users control to select one or more of a plurality of devices, rather than always connecting to the first identified available compatible device, as taught by *Zhang*. I note that *Zhang*'s native process selects the first available and compatible helper server, preventing the user from choosing a preferred device, as indicated by the flowcharts depicted in Figs. 4-5. Indeed, *Zhang* does not expressly teach a user has a choice in selecting a particular nearby device with which to connect. Such a modification would have allowed a user to connect to a particular wireless speaker (e.g., based on location or capabilities) instead of simply connecting to the first (e.g., nearest) available device capable of handling media content. Modifying *Zhang* in this way would have advantageously provided

choice for a user and improved user control over which helper server(s) to use. Such a modification would have been the use of a known technique of allowing a user to select one or more of a plurality of devices and would have benefitted *Zhang-Moore* in the same way it benefits *Rofheart's* similar system. In particular, *Zhang-Moore* and *Rofheart* describe local wireless networks in which devices locate each other to wirelessly exchange data. Thus, a POSITA would have understood that when modifying *Zhang-Moore* in view of *Rofheart*, the same advantageous of *Rofheart's* system would have also applied to the *Zhang* combination.

124. A POSITA would have understood that, in addition to the general benefit of allowing a user to choose from among multiple compatible and available helper servers, further implementing *Rofheart's* UWB wireless technology in *Zhang* provides more precise information about the helper server locations, giving users more insight into the available helper servers and more control over rerouting data to the most desirable server. As an initial matter, the claims merely require locating a plurality of helper servers so a user can choose one. A POSITA would have recognized this functionality is satisfied without *Rofheart's* contemplated UWB wireless technology. Indeed, *Rofheart* teaches advantages of UWB including resolution for locating devices at very short distances away. *Rofheart*, 17:1-12. Such a modification would have allowed helper servers to be located with more precision than other WLAN technologies. However, a POSITA would also have recognized

the benefits of implementing *Rofheart's* UWB wireless technology in *Zhang's* system. Indeed, *Rofheart* teaches that implementing a WLAN with UWB rather than the IEEE 802.11 standard beneficially enables precisely identifying devices—on the order of centimeters up to a couple feet with UWB, rather than ~ 35 feet with 802.11a or 802.11b. *Rofheart*, 15:64-17:55, 18:10-25.

125. Such increased precision for identifying the location of helper servers would have advantageously improved *Zhang-Moore* in the same way as *Rofheart's* system by providing higher precision device location capabilities through using UWB. Modifying *Zhang* to use UWB for the WLAN instead of or in addition to 802.11 or HomeRF would have been use of *Rofheart's* known technique of using UWB for WLAN to improve *Zhang-Moore's* system in the same way as *Rofheart's*, improving device location, which improves the user experience, allowing users to choose helper servers based on precise location in the room, house, or other structure in which a user would use helper servers. A POSITA would have understood that users may be frustrated by *Zhang's* native approach of choosing the first identified compatible device, which may be located inconveniently, e.g., playing audio or video behind the user where the user would prefer a device in front of them, or otherwise not choosing the particular device that a user would have preferred. Modifying *Zhang-Moore* in this way would have provided a user with more choice and more precision for selecting devices based on the physical location of the

devices. In sum, whether UWB is added to *Zhang* or not, modifying *Zhang* pursuant to *Rofheart* beneficially enables more user choice and control. But the option to further improve user control in *Zhang* via *Rofheart's* UWB wireless technology is an additional motivation to combine their teachings.

126. A POSITA would have understood such a modification would have had a reasonable expectation of success because *Zhang-Moore* already teaches the necessary network topology (e.g., plurality of helper servers, mobile devices, connecting to helper servers via WLAN) to support *Rofheart's* functionality, allowing a user to connect to one or more devices from a plurality of available devices. I note that *Zhang-Moore* already teaches utilizing a WLAN, such that implementing UWB on a WLAN (per *Rofheart's* teachings) would have had a reasonable expectation in the *Zhang-Moore* combination as well. Further, such a modification would have been straightforward and well within the abilities of a POSITA, requiring merely minor changes to programming instructions and, in the case of optionally adding *Rofheart's* UWB, a simple substitution of UWB instead of 802.11/HomeRF hardware. Indeed, such UWB hardware and software/instructions would have been available as off-the-shelf components or already installed in mobile or other wireless devices (per *Rofheart*), such that a POSITA would have had a reasonable expectation of success when modifying *Zhang-Moore* per *Rofheart's* teachings. I note that UWB was already present in the marketplace and in portable

devices such as those taught by *Rofheart*, such that a POSITA would simply be using already commercially available, off-the-shelf components or devices when implementing *Rofheart*'s teachings in the *Zhang* combination.

**D. Claim 1(c): selecting, based on a user interaction made with said mobile device and while said media data stream is streamed to said mobile device from said external source according to said streaming protocol, one of said plurality of devices;**

127. As discussed above, *Zhang* in view of *Moore* teaches streaming audio/video from an external source to a mobile device according to a streaming protocol. *See* Claim 1(a). *Zhang-Moore-Rofheart* teaches scanning a local network to identify a plurality of compatible devices and that said helper servers announce their availability. *See* Claim 1(b).

128. Further, as discussed below in the following subsections, *Zhang-Moore* in view of *Rofheart* teaches a user selecting one or more helper servers to connect to for data transfer (e.g., streaming audio/video) by selecting said helper servers on a display screen. Regarding the claimed “while said media data stream is streamed to said mobile device ...,” *Zhang* teaches an embodiment where a mobile device moves and streams video to a succession of helper servers while maintaining display continuity amongst the various helper servers. *Zhang*, 10:58-65. A POSITA would have understood that providing such display continuity would have included the mobile device connecting to a plurality of helper servers at the same time. That is, while a user is connected to a first helper server, a second connection is established,

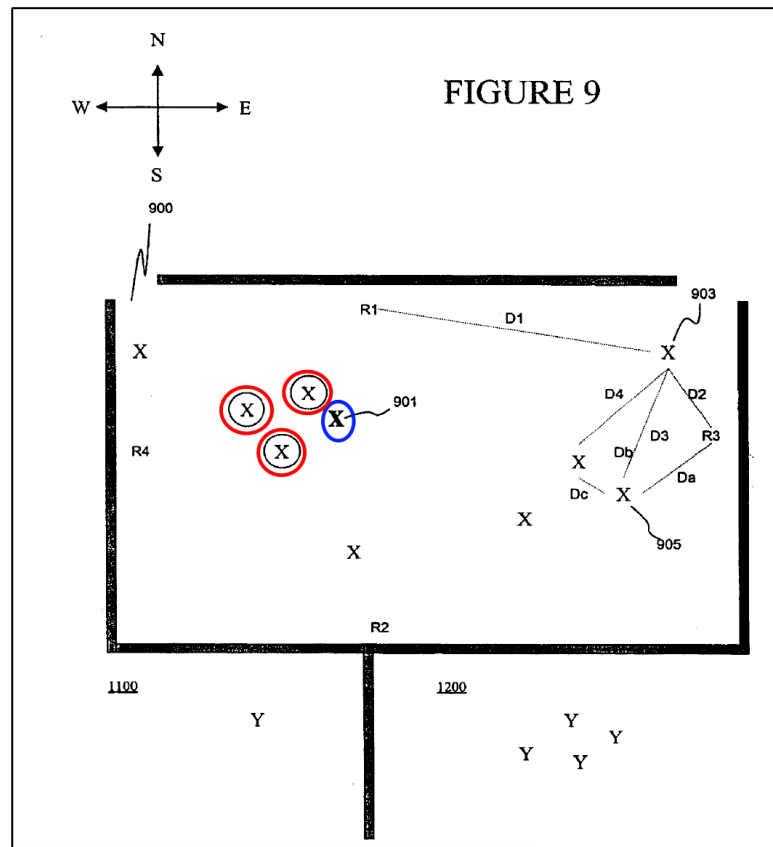
so that when a user moves to the next location, the transition from first helper server to second helper server would have been seamless. Indeed, *Zhang* teaches such a “seamless mobility” embodiment. *Zhang*, 10:58-65. As discussed below, where a user is switching from one wireless speaker to another, the speaker would have been selected (per *Rofheart*’s teachings) while *Zhang-Moore*’s media data stream is being streamed from an external source to said mobile device. A POSITA would have understood that such a modification would have been in line with *Zhang*’s native “seamless mobility” embodiment that would have provided display continuity across multiple helper servers. As also discussed below, even where the user is selecting a first wireless speaker to receive a new audio stream, a POSITA would have found it obvious to implement *Zhang-Moore-Rofheart* such that a user selects the wireless speaker after the mobile device begins to receive streaming audio from the web, thus allowing a user to choose a particular helper server to render the streaming media content.

***1. Rofheart Teaches Selecting One of a Plurality of Devices Based on User Interaction with a Mobile Device***

129. *Rofheart* teaches that a user may select one or more of a plurality of devices. *Rofheart*, 18:54-58 (“[A] local device may display a positional map of all users in relation to the local device so that the user of the local device may select those remote devices that the user wants to communicate with[.]”), 5:37-45, 28:22-38 (teaching local device 901 “displays a graphical map of the position of each

remote device in conference room 900 from which the user of the local device may choose remote devices to enable communications with.”). The local device’s “display 213 has touch screen capabilities that allow the user to select a remote device by contacting the display with a pointing device, for example.” *Rofheart*, 30:10-18. “If the user of the local device 901 selects a device on the display of the local device, then the local device 901 enables communications with that device as shown in step 1013.” *Rofheart*, 30:18-24, 27:46-28:38.

130. After a user selects one or more devices, local device’s display 213 is updated, “indicat[ing] which remote devices are enabled as positional information is updated.” *Rofheart*, 30:33-49 (noting enabled devices may be circled on the display). Fig. 9 below shows local device (annotated blue), remote devices with which connections are established (annotated red), and other remote devices without established connections (indicated with “X,” but not highlighted):



*Rofheart*, Fig. 9 (annotated).

131. *Rofheart* teaches that the communications between the local device and remote devices include “transmitting and receiving communications such as text, video and voice on the unique links associated with the enabled remote devices as seen in step 1019.” *Rofheart*, 30:25-49. If a user wishes to change which devices with which to connect, the change can occur at any time by selecting or deselecting said remote device(s) on display 213. *Rofheart*, 30:49-52.

## ***2. Motivation to Combine Zhang and Rofheart***

132. The motivation to combine these references, as set forth above with reference to Claim 1(b), also applies here.

133. A POSITA would have understood that the proposed *Zhang-Moore-Rofheart* combination advantageously allows a user to selectively switch between wireless speakers moving within a building, continuously and seamlessly playing Web-sourced streaming audio. Indeed, *Zhang* itself provides such teachings of a “seamless mobility” embodiment, where a user may switch between different helper servers while maintaining “display continuity” across the devices because the streaming content can be switched to being transmitted to a different helper server instead of a current helper server. *Zhang*, 10:58-65. *Zhang* teaches functionality in which a user can switch between helper servers while, for example, moving through a building. A POSITA would have understood that in at least this described mobility-focused embodiment, data streamed through *Zhang*’s modified mobile device would be actively streaming to the mobile device when the user selects a new wireless speaker. A POSITA would have understood such because the streaming content would have maintained “continuity,” (which a POSITA would have understood would have included audio and/or video continuity as well) per *Zhang*’s teachings.

134. Motivations to make the proposed combination are not limited to this mobility scenario, however. As discussed in Section IX.B.5, motivations to combine

*Zhang* and *Moore* include providing users additional control over *when* to reroute streaming audio and *what* streaming audio to reroute to a helper server. In one example, only a portion of streaming audio (i.e., the low frequency bass) is rerouted to a wireless speaker, playing the retained audio via the mobile device's built-in speakers. A POSITA would have recognized that actively streaming audio to the mobile device when the user decides whether to reroute audio data would have provided additional control, improving the user experience. Indeed, a POSITA would have appreciated that some users would prefer the option to begin playing audio on the mobile device speakers before deciding on whether or not to reroute the audio to a larger wireless speaker, such as the external audio system *Moore* teaches. Accordingly, whether a user is implementing *Zhang's* mobility function, choosing a second wireless speaker to transition audio to, or choosing a first wireless speaker for a given audio stream, a POSITA would have been motivated to implement the combination such that audio is streaming to the mobile device when the user makes her selection. Such would have advantageously provided a user with control over the media playback experience. Indeed, this beneficial flexibility is possible only when *Zhang* is modified as proposed herein.

135. The proposed modification would have had a reasonable expectation of success because *Zhang-Moore* already teaches receiving and rerouting streamed media content (e.g., video/audio) and *Zhang-Moore* as modified by *Rofheart* teaches

selecting one or more helper servers for rerouting said streaming. *See* Claim 1(b). A POSITA would have understood that the process of selecting a helper server device to stream media to would have been similar whether the mobile device was already receiving the stream at that moment or not. Indeed, a user would have made a selection of a helper server to connect to, per *Rofheart's* teachings, in the same manner regardless of whether the mobile device was currently receiving a media stream or not, such as by using a user interface such as the one taught by *Rofheart*, where the user's selection would not have been made in a different manner simply because media content was being streamed to the mobile device at that moment. Thus, a user would have made a selection to connect to one of a plurality of devices while a media data stream is streamed to the mobile device.

136. Additionally, a POSITA would have understood and found obvious to use a mobile device to select a helper server to connect to, as *Zhang* already teaches a mobile device with a display and user input capabilities. For example, *Zhang* teaches a mobile phone and PDA, which a POSITA would have understood would have included features such as buttons/keys and a screen. *Zhang*, Fig. 1, 1:22-24, 3:25-31, 4:35-38. Indeed, selecting a helper server (based on distance information) would have been straightforward, requiring only straightforward changes to hardware, software or program instructions to accommodate *Rofheart's* teachings, including using commercially available components or devices, as I discussed

above. *Rofheart*, 28:30-33, 28:39-42. *See* Claim 1(b). A POSITA would have understood that such selections would not have required a touchscreen display to implement. For example, *Zhang-Moore-Rofheart's* devices would have been selected via menu options or other user input in an embodiment where the mobile device lacks a touch screen but has buttons or keys a user can press to make selections. Alternatively, a POSITA would have been motivated to modify *Zhang-Moore-Rofheart's* device to utilize a touchscreen to capture *Rofheart's* advantages. I note that in one embodiment, *Rofheart* teaches implementing selecting and deselecting remote devices using a touchscreen display. *Rofheart*, 30:10-24, 4:50-53, 30:49-52. A POSITA would have found it obvious and been motivated to modify *Zhang* to utilize a touchscreen per *Rofheart's* teachings to capture *Rofheart's* advantages, including providing a simple method for users to make a selection. Indeed, a POSITA would have understood such a modification of using a touchscreen would have advantageously provided improved ease of use, quick selection time, and simplicity for selecting one of a plurality of devices with which to connect rather than requiring a user to navigate potentially complicated menu options using a keypad, for example.

137. Such a modification would have had a reasonable expectation of success because *Zhang-Moore* and *Rofheart* teach similar mobile devices, and mobile devices with touchscreens were well known in the prior art, including

*Rofheart's* mobile device. *See* also my discussion above at Sections V.E-V.F. A POSITA would have understood that while modifying *Zhang* to utilize a touchscreen device may have incurred some additional cost, a POSITA would have been motivated to utilize a touchscreen device to capture *Rofheart's* advantageous selection/deselection teachings and to provide quick and simple selection/deselection capabilities, such that increased cost would have been an acceptable tradeoff to achieve *Rofheart's* advantages. I further note that mobile devices that included touch screens were already commercially available, off-the-shelf devices and components, such that a POSITA would not have had to physically install a touch screen in *Zhang's* mobile device, but rather a POSITA would have been able to select from already commercially available devices with a touch screen. *See* my discussion above at Sections V.E-V.F.

**E. Claim 1(d): setting up a wireless communication link with said selected compatible device via said local wireless communication network;**

138. *Zhang* teaches that a mobile device transmits a service request to at least one helper server and said helper server responds by accepting the service request if compatible and available. *See* Claims 1(b), (c).

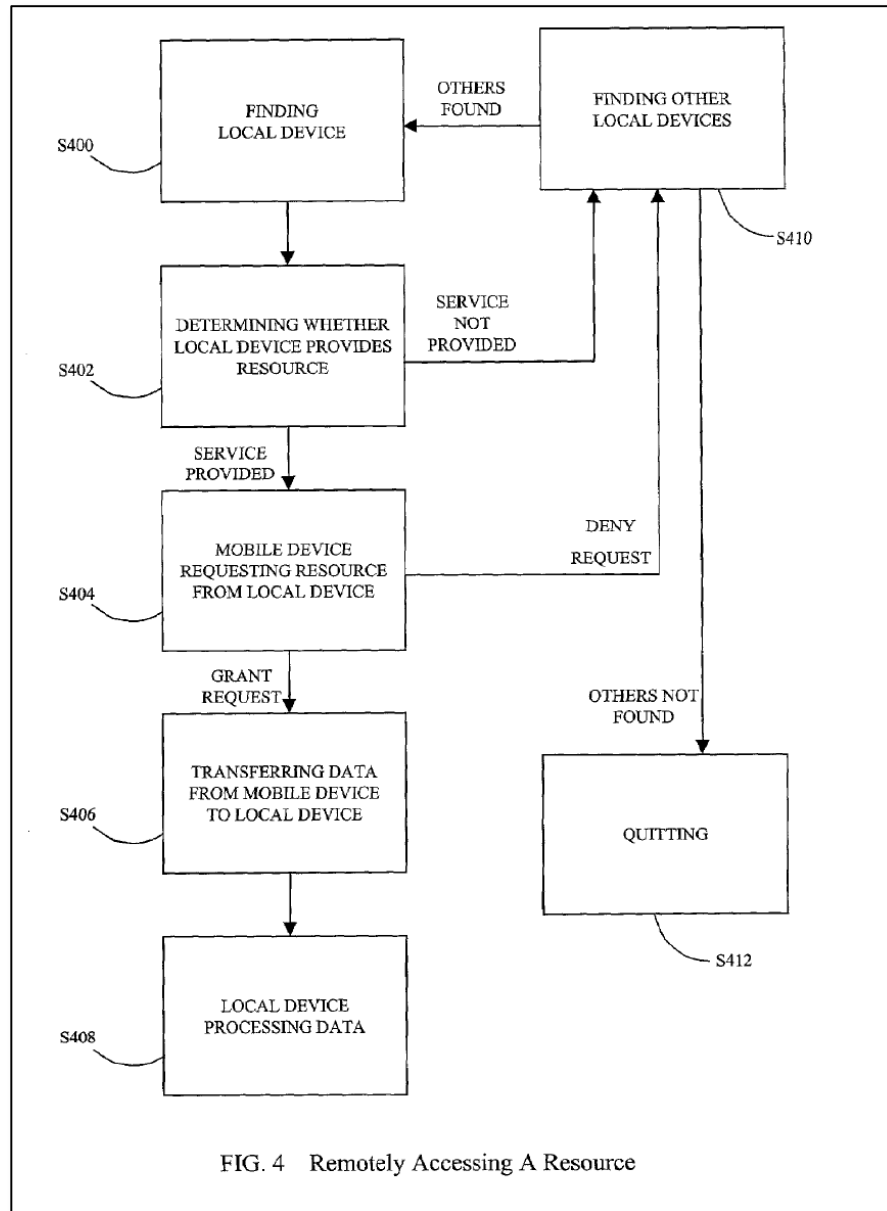
139. *Zhang* teaches setting up a session (“wireless communication link”) between a “helper client” (mobile device) and helper server using TCP (or UDP).

*Zhang*, 9:51-10:7. I note that I also opined above regarding TCP and UDP being streaming protocol. *See* Section V.D.

140. *Zhang* teaches that a session is created between a mobile device and helper server “from the time the client request is accepted by the server and ends when the user finishes using the helper service.” *Zhang*, 9:54-60. In particular, *Zhang* teaches that a user may terminate the session with a helper server based on a “client request.” *Zhang*, 6:6-34. Further, *Zhang* teaches that “[d]uring the session, both data and control information are exchanged” via “the TCP connection between the client and the server.” *Zhang*, 9:54-60. A POSITA would have understood that such a connection via TCP/IP or UDP/IP (i.e., streaming protocol) would have utilized *Zhang*’s WLAN (i.e., local wireless communication network) for setting up the session (i.e., wireless communication link) between the mobile device and selected helper server (i.e., selected compatible device). Indeed, a POSITA would have understood that streaming protocols such as TCP/IP and UDP/IP were utilized with network protocols such as WLANs, such that communications between devices connected to the WLAN would have utilized the WLAN as the network along with streaming protocols such as TCP/IP or UDP/IP.

141. A POSITA would have understood that such a session between a mobile device and a helper server is a wireless communication link via said local wireless communication network (e.g., WLAN, *see* Claim 1(Pre)-1(a)). I note that

*Zhang*'s session provides a wireless communication link between devices and that the session information is transmitted via the WLAN, which is the wireless network that the helper servers and mobile device are connected to and the network via which said devices communicate with each other. Specifically, accepting a service request prepares a helper server for receiving content and commands from a mobile device by initiating a session between said handheld device and said helper server. For example, *Zhang* teaches a "local device" (e.g., helper server) granting a service request results in "transferring data from mobile device to local device" at step S406. *Zhang*, 4:5-8, 4:32-34 (teaching the same but for the embodiment of Fig. 5).



Zhang, Fig. 4, see also Fig. 5.

142. Finally, a POSITA would have understood that, where UWB is optionally added to the combination to improve precision, *Zhang-Moore* as modified by *Rofheart* would have utilized *Rofheart's* UWB to set up a TCP or UDP session (i.e., wireless communication link) with a selected compatible device via said local

wireless communication network (e.g., WLAN). *See* Claim 1(b)-1(c). Indeed, UWB is utilized for scanning the WLAN and identifying a plurality of devices and then selecting one or more devices with which to connect. *See* Claim 1(b)-1(c). A POSITA would thus have understood that such selection would have set up a TCP or UDP session using a wireless communication link using UWB for the WLAN. *See* Claim 1(b)-1(c).

**F. Claim 1(e): causing a routing of said media data stream of media content to said selected device via said wireless communication link for streaming said media data stream according to said streaming protocol for presentation of said media content by a media player of said selected device.**

143. As discussed above, *Zhang-Moore* teaches rerouting all or part of an audio stream. *See* Claim 1(a). *Zhang-Moore* teaches wirelessly receiving a media data stream from an external source at a mobile device according to a streaming protocol. *See* Claim 1(a). *Zhang-Moore* in view of *Rofheart* teaches identifying a plurality of devices and selecting one or more devices to connect to. *See* Claims 1(b)-(c). Further discussed above, *Zhang* teaches setting up a session (i.e., wireless communication link) using TCP/IP or UDP/IP with said compatible selected device(s) to transmit data and commands. *See* Claim 1(a), 1(d). *Zhang-Moore* teaches said session is used to stream a media data stream according to a streaming protocol (e.g., TCP/IP, UDP/IP) for presentation by a media player of a selected device (e.g., helper server), as discussed below.

**1. '223 Patent's Media Player**

144. I note that the '223 Patent does not use the phrase “media player” outside the claims, but it does describe *single-function* devices for playing media. '223 Patent, 5:29-41 (discussing a “video player”), 10:11-41 (describing MP3 players, VCR players, and DVD players). The '223 Patent also describes multi-function devices capable of playing media. *Id.*, 5:31-38 (noting that “video data . . . may be directed . . . to a convenient nearby video player or *multimedia enabled PC*”). Because Claim 1 recites a device “compatible to handle [] media” where the media is presented “by a media player of said selected device[,]” Claim 1 should not be limited to single-function devices for playing media and should also capture media player functionality in a multi-function device. Additionally, because there is no specific meaning ascribed to “media player” in the '223 Patent, Petitioner has interpreted the claim element to capture the hardware and/or software of a multi-function device that enables the device to process and present media to the user.

**2. Zhang's Media Player**

145. A POSITA would have understood that *Zhang's* audio-based helper servers (e.g., wireless speakers) include hardware and/or software capable of processing and playing said audio to the user and are thus media players. I note that the '223 Patent at 9:44-48 describes “routing an audio stream to nearby speakers” and does not elaborate as to any specific hardware or software within the speaker

that processes the audio stream, but the audio stream is rendered (i.e., played) at the speakers.

146. *Zhang* teaches streaming audio/video to helper servers and that the helper servers display or present the media content. In one embodiment, PDA 30 “establishes a connection with the helper server 24 and transfers the content to the helper server 24 for display.” *Zhang*, 3:25-43 (including audio device 28), 3:55-60, 4:1-8, 4:32-38, 7:1-13, 8:13-19 (teaching a user remotely controlling the display of streaming data by issuing “stop,” resume,” and “fast forward” commands to the helper server presenting the media content), 10:58-65 (teaching streaming video). A POSITA would have understood that devices capable of playing back media, as disclosed in *Zhang*, are media players.

147. Thus, a POSITA would have understood that during the modified *Zhang*’s TCP or UDP session, streaming data would have been routed from an external source to a mobile device and then rerouted from the mobile device to at least one selected helper server for presentation thereon via a media player. *See* Claims 1(a)-1(d). Indeed, the combined *Zhang-Moore* system would have included a mobile device that received streaming media, such as streaming audio, from a Web server and would have then routed the audio stream to a helper server, such as an external audio system (e.g., speakers), which would have presented the audio content via a media player.

**3. Motivation to Combine Zhang and Moore**

148. As discussed above with reference to Claim 1(a), a POSITA would have been motivated to modify *Zhang* pursuant to *Moore* such that streaming audio is received by the mobile device and is rerouted (in whole or in part) to one or more helper servers. That discussion is incorporated herein by reference. *See* Claim 1(a).

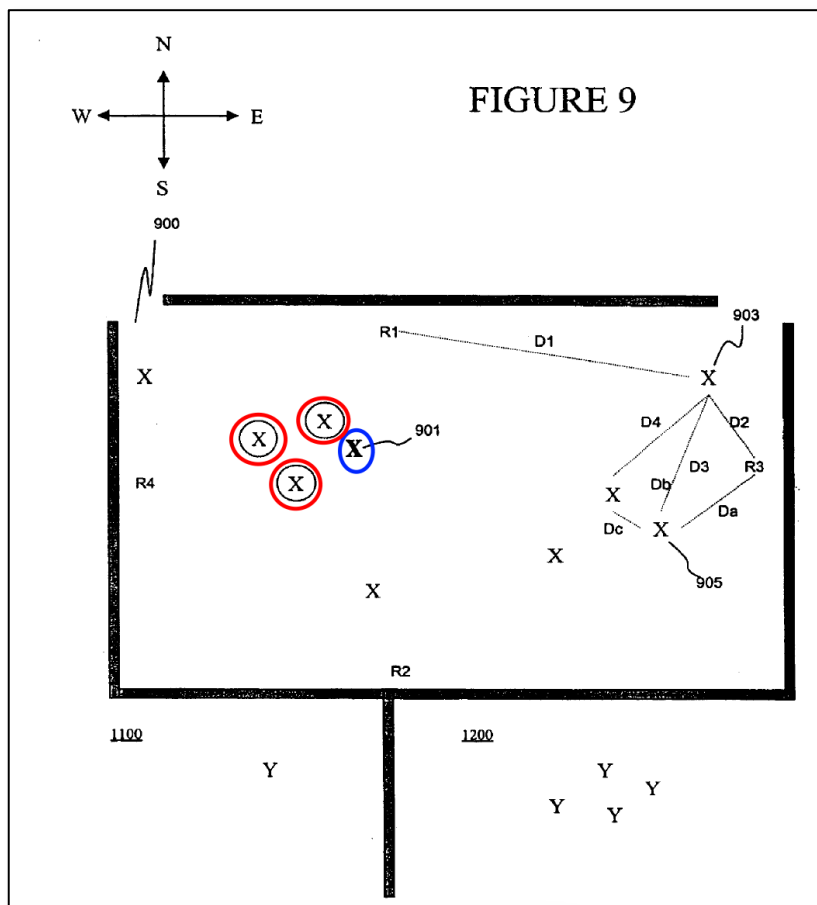
**G. Claim 5: The method of claim 1, wherein said selecting comprises displaying a menu at said mobile device to allow a user to perform said user interaction.**

149. As set forth above with reference to Claims 1(b)-(c), the proposed combination, pursuant to *Rofheart's* teachings, permits a user to select one of multiple compatible devices via interacting with the mobile device. *Rofheart* teaches a graphical user interface (GUI) where a user makes a selection for which device(s) to connect to. Specifically, *Rofheart* teaches “the display 213 of the processor system 201 of local device 901 displays a graphical map of the position of each remote device in conference room 900 from which the user of the local device may choose remote devices to enable communications with.” *Rofheart*, 28:22-27. Further, *Rofheart* teaches that in “making a selection, the user of local device 901 looks at the display 213 and associates the devices on the display with a remote device visually verified by the local user.” *Rofheart*, 28:30-33.

150. A POSITA would have been motivated to modify *Zhang-Moore* per *Rofheart's* teachings of making a selection of one or more devices to connect to by

using a GUI as a menu. Such would have been using a well-known technique of allowing a user to make a selection on the modified *Zhang's* mobile device by selecting devices via the menu on the GUI. *Rofheart*, Fig. 9, 28:22-33. Such a use of a known technique would have advantageously improved *Zhang-Moore's* similar system in the same way as *Rofheart's* system. Indeed, such a modification would have allowed a user to make a selection by using a GUI as a menu. I note that I discussed above that GUIs were well known and utilized for mobile devices before the priority date of the '223 Patent. *See* Section V.E.

151. Such a modification would have had a reasonable expectation of success because using a GUI as a menu for making selections was well known in the prior art. *See* Section V.E. Further, such was discussed above for Claim 1(b)-1(c) and is incorporated herein. Additionally, *Zhang-Moore* and *Rofheart* teach similar mobile devices, such that implementing *Zhang-Moore* per *Rofheart's* teachings would have been straightforward and utilized commercially available, off-the-shelf components and/or devices, thus ensuring a reasonable expectation of success when modifying *Zhang-Moore* per *Rofheart's* teachings.



*Rofheart*, Fig. 9 (annotated), *see also*, Fig. 10.

**H. Claim 8: The method of claim 1, wherein said setting up comprising transforming said media content into a form that accords with a media type requirement of said selected device.**

152. *See* Claim 1. As set forth above, *Zhang-Moore* as modified by *Rofheart* utilizes *Rofheart's* UWB to set up a TCP or UDP session (i.e., wireless communication link) with a selected compatible device via said local wireless communication network (e.g., WLAN), which is used to reroute all or part of an audio stream from the mobile device to a wireless helper speaker. *See* Claim 1(d-e).

153. Pursuant to *Moore*'s teachings, a POSITA would have been motivated to transform the streaming audio in the mobile device (before rerouting to the wireless speaker) to accord with a media type requirement of the wireless speaker. Indeed, such would have allowed the speaker to play the received audio because in this way the speaker would receive a compatible media type that it is capable of playing. *Moore* teaches that the mobile device can perform a media type transformation of the audio enhancement signal prior to sending that enhancement signal wirelessly to the speaker. *Moore*, 5:65-6:14 (noting optional "digital-to-analog converter 84" may be used to convert the enhancement signal "for transmission to the external audio system 14 via wireless interface 26"). A POSITA would have understood that other types of audio conversions other than converting digital to analog (or vice versa) were known at the time, including CODECs (coder/decoder) that transform audio coding. Indeed, a POSITA would have understood that CODECs were well known and widely utilized for converting between coding types, including to match the available CODECs in an output device and to tradeoff between audio quality and bandwidth requirements where wireless transmission was involved. For example, utilizing a compressed, lower quality audio format such as MP3 requires less bandwidth to transmit than a higher quality, uncompressed audio format, such as WAV. A POSITA would also have recognized the benefits of performing such transformations in the mobile device prior to

rerouting audio to a wireless speaker. As explained in the Claim 1 mapping, a primary benefit of modifying *Zhang* pursuant to *Moore* is expanding a user's choice of helper servers, allowing the user to deploy non-Internet enabled wireless speakers. Performing media type transformation in the mobile device would similarly benefit *Zhang's* system, allowing the user to deploy wireless speakers with more limited audio processing capabilities, relying instead on the media type transformation capabilities of the mobile device. Indeed, performing such media type transformation in the mobile device would have utilized the capabilities of the mobile device, including a GUI, for example, to select transformations so that a non-Internet enabled device, such as speakers, would have thus been able to play received audio that conforms to the media type requirements of the speakers. A POSITA would have expected success in making the combination, at least because *Moore* expressly teaches such functionality in its mobile device and because CODECs were well established and widely deployed. *See* Section V.H.

**I. Claim 10: The method of claim 1, further comprising encrypting said media data stream of media content before routing to said selected device.**

154. *See* Claim 1. Pursuant to *Rofheart's* teachings, a POSITA would have found it obvious to encrypt the media stream before re-routing to a helper speaker. *Rofheart* teaches encryption between a mobile device and a selected remote device. *Rofheart*, 31:48-32:30 (teaching performing encryption using public key

cryptography techniques). A POSITA would have understood that such encryption would have functioned not just with “messages” but also other data such as media data (e.g., audio, video). Indeed, encrypting other digital data such as audio and video would have utilized a similar process for performing encryption for messages.

155. A POSITA would have been motivated to modify *Zhang-Moore* in view of *Rofheart* to secure communications (e.g., media stream) between a mobile device and one or more selected devices so that other non-selected devices cannot spy on or otherwise view or access said communications even if an unauthorized party were to intercept the media stream. Encryption would have helped provide such security to protect communications from any third parties not authorized to view said communications. Such a modification would have had a reasonable expectation of success because such security techniques were well known and understood including for streaming media. Encrypting audio or video media before transmission would have been straightforward and similar to performing encryption on messages to protect message contents.

**J. Claim 11- The method of claim 1, wherein said wirelessly announce is wirelessly announce an availability for accepting a routed media and an availability for accepting a type of said routed media.**

156. *See* Claim 1. As set forth above, in response to receiving a service request from a mobile device, *Zhang’s* helper servers announce their availability to service the request. *See* Claim 1(b). *Zhang* teaches that the mobile device’s service

“request may contain . . . the MIME type of the user data[.]” *Zhang*, 7:1-8. A POSITA would have been familiar with MIME type—also referred to as media type—as a data field that indicates the type of media to be routed/communicated. Indeed, I discussed such above. *See* Claim 1(b). When *Zhang*’s service request indicates a MIME type, a helper server responsively announcing its availability to service the request also announces—at least implicitly—availability for accepting a type of routed media, as claimed. A POSITA would have understood such because the MIME type would have indicated the media type such as audio, video, images, etc., and would also have indicated a particular codec or data type (jpg, MP3, etc.). Indeed, I note that the ’223 Patent never describes a wireless announcement that expressly indicates compatibility with a media type. From this, a POSITA would have understood that Claim 11 captures implicit acknowledgement of media type compatibility. A POSITA would have understood that *Zhang*’s transmitted MIME type information would have satisfied such wirelessly announcing compatibility for accepting a type of routed media by informing helper servers of what type of media is being requested to be serviced by the helper server.

**K. Claim 14(Pre): A mobile apparatus of routing media data stream, comprising:**

157. The mappings for Claim 14 below focus on apparatus elements that perform the same/similar functions discussed for Claim 1. *Zhang* alone or in view of *Moore* teaches a “mobile apparatus of routing media data stream.” Specifically,

*Zhang* alone or in view of *Moore* teaches routing media data stream between a mobile device and a helper server. *See* Claim 1(a), 1(e).

**L. Claim 14(a): a receiver wirelessly adapted to receive a media data stream transmitted according to a streaming protocol and comprising media content from an external source via a local wireless communication network, said media content is selected from a group consisting of; audio content and video content;**

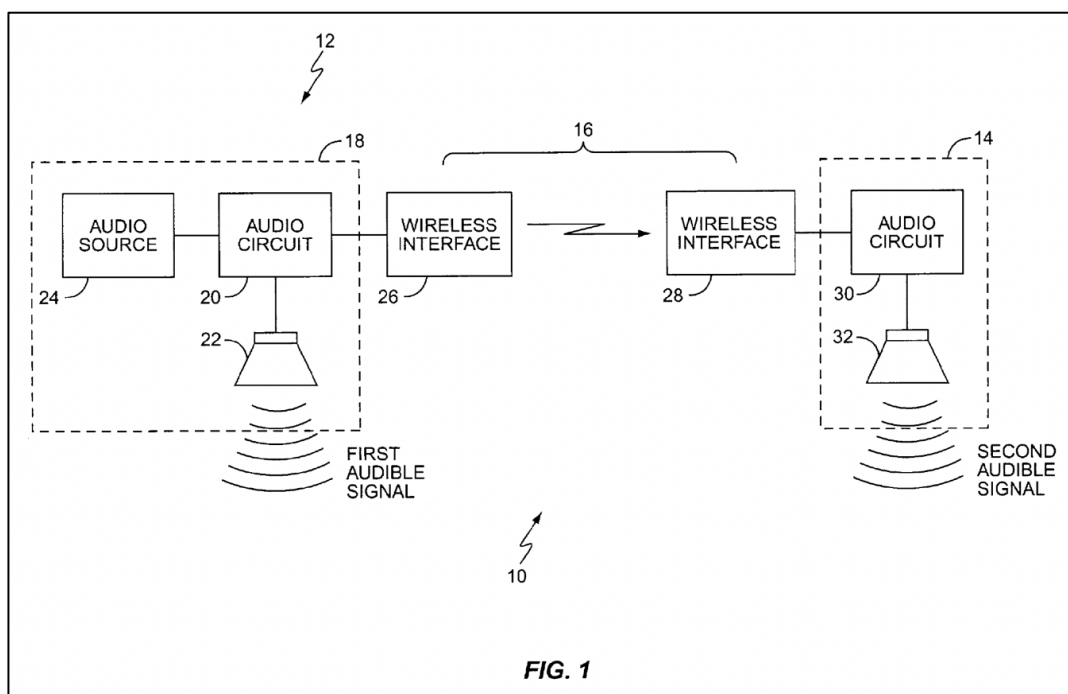
**1. *Zhang's Teachings***

158. *Zhang* teaches a mobile apparatus such as a PDA or cell phone. *Zhang*, 3:25-31, 4:35-38. As set forth above with reference to Claim 1(a), a POSITA would have been motivated to modify *Zhang* according to *Moore's* teachings (1) to route an audio stream from an external source (a Web server) via a local wireless communication network to a mobile device and then (2) to reroute some of all of that audio stream to a helper device (e.g., a speaker) via the same local wireless communication network. A POSITA would have understood that the mobile device in this combination would have included a receiver adapted to wirelessly receive a media data stream transmitted according to a streaming protocol. Indeed, a POSITA would have understood that a mobile device such as *Zhang's* would have included hardware such as a transceiver or receiver for wirelessly receiving a media data stream. To the extent Patent Owner argues that *Zhang* does not sufficiently describe its mobile device's receiver, *Moore* provides details of such a receiver, and a

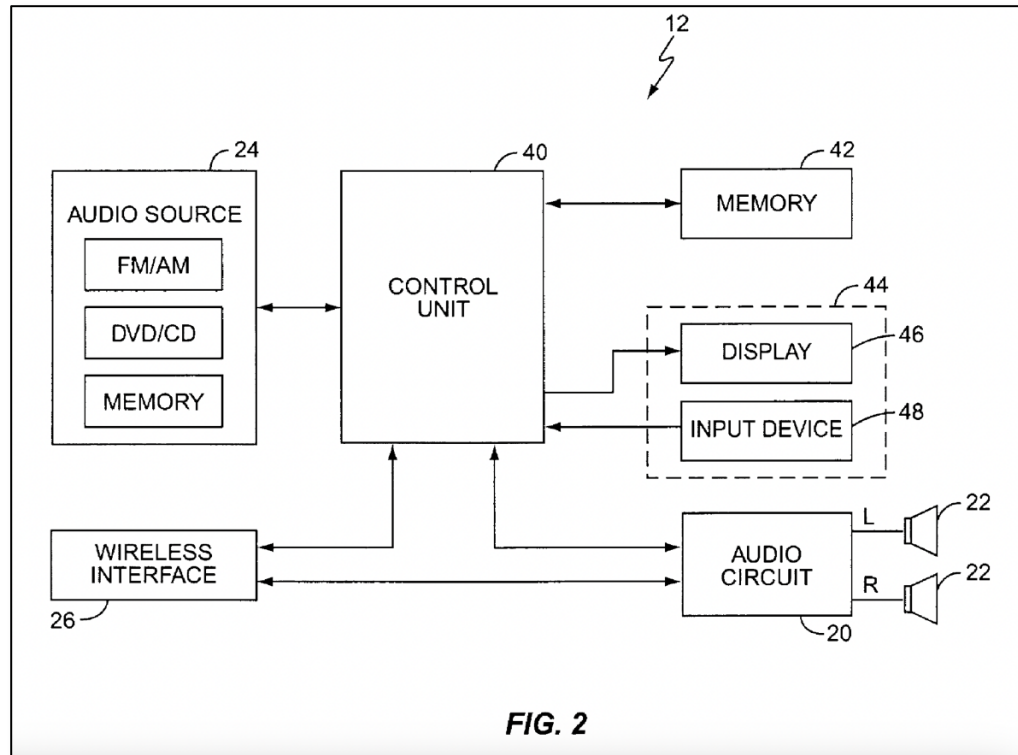
POSITA would have been motivated to incorporate *Moore's* receiver in *Zhang's* device. See Claim 1(a).

## 2. *Moore's* Teachings

159. *Moore* teaches portable device 12 includes a wireless interface (e.g., wireless transceiver). *Moore*, 4:1-20, 2:51-3:3, 3:35-53. I note that *Moore's* Fig. 1 below depicts wireless interface 26 of portable audio device 12:



*Moore*, Fig. 1. Additionally, *Moore's* Fig. 2 below depicts components of portable audio device 12, including wireless interface 26:



*Moore*, Fig. 2. Further, *Moore* teaches receiving streaming audio from the Web. *Moore*, 8:4-8, 8:15-25, 8:54-67, 2:10-18; see Claim 1(a). A POSITA would have understood that *Moore*'s components such as a wireless interface would have functioned as a wireless transceiver for *Moore*'s mobile device to transmit and receive wireless signals, including streaming media.

### 3. Motivation to Combine Zhang and Moore

160. A POSITA would have been motivated to modify *Zhang* in view of *Moore* and would have had a reasonable expectation of success for the same reasons discussed at Claim 1(a). See Claim 1(a).

161. Further, a POSITA would have been motivated to modify *Zhang* to include *Moore*'s wireless receiver hardware. A POSITA would have understood that

such a modification would have provided *Zhang's* mobile device with wireless transmitting and receiving functionality (to the extent it is argued *Zhang* does not teach, for example, hardware for such functionality). Such a modification would have been combining prior art elements (e.g., microprocessor, wireless transceiver) according to known methods to yield the predictable result of a mobile device (e.g., cellular phone) that receives streaming audio from the Web, as taught by *Moore*. Such a use of a known technique of using such hardware components in mobile devices would have improved *Zhang's* similar mobile device in the same way as *Moore's*. Indeed, such would have provided *Zhang's* similar mobile device with wireless transmitting and receiving capabilities. Further, *Zhang* and *Moore* both teach similar mobile devices (e.g., cellular phones), such that modifying *Zhang* in view of *Moore's* teachings would have been straightforward and would have had a reasonable expectation of success. I note that such hardware components were widely available and commonly used for wireless devices such as a mobile phone. Indeed, one of the main functions of a mobile phone is to transmit and receive data wirelessly, such that modifying *Zhang* per *Moore's* teachings would have achieved the same functionality as taught in *Moore*. Indeed, such prior art teachings were a known solution to a problem and would have been within the skillset of a POSITA to implement. See Section V.F where I discussed such mobile device hardware.

**M.Claim 14(b): a scouting detector adapted to scan said local wireless communication network to identify a plurality of devices, identified as compatible to handle said media content, said plurality of devices are wirelessly connected to said local wireless communication network and wirelessly announce an availability for accepting a routed media via said local wireless communication network;**

**1. *Zhang's Teachings***

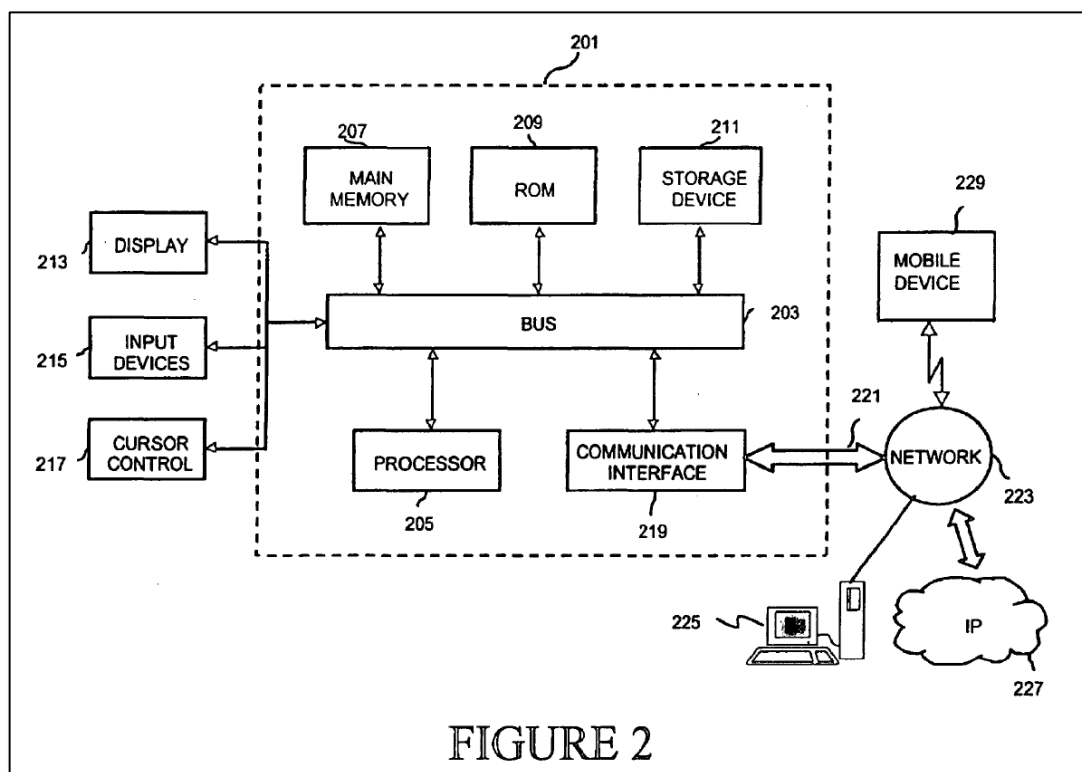
162. *Zhang* teaches performing device discovery to scan the wireless network to identify nearby helper servers. *See* Claim 1(b). A POSITA would have understood that a mobile device such as a PDA or cell phone would have included hardware including a scouting detector to perform such local wireless network scanning to identify a plurality of devices. Indeed, such functionality would have allowed *Zhang's* mobile device to scan to identify nearby helper servers. *See* Claim 1(b).

**2. *Rofheart's Teachings***

163. To the extent it is argued *Zhang* does not expressly disclose hardware to perform such functionality, *Rofheart*, teaches such.

164. *Rofheart* teaches processor system 201 of a local device (e.g., PDA, mobile telephone, laptop computer) where processor system 201 “performs a portion or all of the processing steps of the invention in response to the processor 205 executing one or more sequences of one or more instructions contained in a memory, such as the main memory 207.” *Rofheart*, 14:14-15:22, 13:29-14:13. In particular, *Rofheart* teaches “local devices” may be “a mobile device 229 such as a personal

digital assistant (PDA) laptop computer, or cellular telephone.” *Rofheart*, 26:42-46, 15:50-53, Fig. 3, 2:10-12. Further, *Rofheart* teaches processor system 201 includes communication interface 219, which “provides a two-way UWB data communication coupling to a network link 221 that is connected to a communication network 223[.]” *Rofheart*, 15:23-64. Fig. 2 below depicts *Rofheart*’s processor system 201 of a local device including communication interface 219.



*Rofheart*, Fig. 2, 24:10-55, 28:22-57.

### 3. Motivation to Combine Zhang and Rofheart

165. A POSITA would have been motivated to modify *Zhang* in view of *Rofheart* and would have had a reasonable expectation of success for the same reasons discussed above at Claim 1(b). *See* Claim 1(b).

166. A POSITA would have been motivated to modify *Zhang* (to the extent it was not expressly taught in *Zhang*) to include software (and optionally UWB hardware) such as taught by *Rofheart* to use a communication interface (“scouting detector”) adapted to scan the local communications network to identify a plurality of devices identified as compatible to handle media content. Such a modification would have advantageously provided *Zhang* with software and optionally hardware for performing its scanning and identification functionality. Such a modification would have been combining prior art elements (e.g., processor, communication interface, software instructions) according to known methods to yield the predictable result of a mobile device (e.g., PDA) that scans for a plurality of devices connected to a local wireless network as taught by *Rofheart*. I note that *Rofheart* teaches using software instructions and hardware for such scanning and identifying, and modifying *Zhang* per *Rofheart*’s teachings would have similarly yielded a predictable result of utilizing software and optionally hardware, such as taught by *Rofheart*, to perform scanning and identification functionality. Such a use of a known technique of using such software and optionally hardware components in mobile devices would have improved *Zhang*’s similar mobile device in the same way as *Rofheart*’s. Indeed,

*Rofheart* teaches scanning for nearby compatible devices with which to connect, and a POSITA would have been motivated to modify *Zhang* per *Rofheart*'s teachings to achieve the same benefits.

167. Further, *Zhang* and *Rofheart* both teach similar mobile devices (e.g., PDAs), such that modifying *Zhang* in view of *Rofheart*'s teachings would have been straightforward and would have had a reasonable expectation of success. A POSITA would have understood that including such software and optionally hardware in a mobile device would have been straightforward, including because such components were commonly already present in mobile devices to perform wireless scanning functions. Indeed, such prior art teachings were a known solution to a problem and would have been within the skillset of a POSITA to implement. *See* Section V.F where I discussed some exemplary prior art mobile devices.

**N. Claim 14(c): a controller adapted to select, based on a user interaction made with said mobile apparatus, one of said plurality of devices and to instruct a setting up of a wireless communication link with said selected device via said local wireless communication network;**

168. To the extent it is argued *Zhang* does not teach a controller adapted to select one of a plurality of devices and set up a wireless communication link, a POSITA would have been motivated to modify *Zhang* in view of *Rofheart*'s teachings and would have had a reasonable expectation of success when doing so. *See* Claims 1(c), 1(d), 14(b).

169. As discussed above, *Rofheart* teaches a user may select one or a plurality of devices to connect to. *See* Claim 1(b)-1(d), 14(b). Also discussed above, *Rofheart* teaches processor system 201 of a local device (e.g., PDA, mobile telephone, laptop computer) that performs processing steps. *See* Claim 14(b). I note that processors were commonly included components in mobile devices, such as cellular phones and PDAs. *See* Section V.F where I discussed such prior art mobile devices that included hardware including a processor.

170. A POSITA would have been motivated to modify *Zhang* in view of *Rofheart* and would have had a reasonable expectation of success for the same reasons discussed above. *See* Claims 1(b), 1(c), 14(b). Indeed, such prior art teachings were a known solution to a problem and would have been within the skillset of a POSITA to implement. *See* also Section V.

**O. Claim 14(d): wherein said controller is adapted to instruct the routing of said media data stream of media content to said selected device via said wireless communication link for streaming said media data stream according to said streaming protocol for presentation of said media content by a media player of said selected device.**

171. As discussed above, *Zhang-Moore* teaches routing a media data stream for presentation by a media player of a selected device. *See* Claim 1. To the extent it is argued that *Zhang* does not teach a controller adapted to instruct the routing of a media data stream, a POSITA would have been motivated to modify *Zhang* in view of *Rofheart*'s teachings to use a processor for such and would have had a reasonable

expectation of success when doing so. *See* Claims 1(c), 1(d), 14(c). Indeed, I noted that it was common for prior art mobile devices to include a processor. *See* Section V.F where I discussed such mobile device hardware.

172. As discussed above, *Rofheart* teaches a user may select one or a plurality of devices to connect to. *See* Claim 1(c). Also discussed above, *Rofheart* teaches a processor system 201 of a local device (e.g., PDA, mobile telephone, laptop computer) that performs processing steps. *See* Claim 14(b), 14(c). *Rofheart* also teaches storing processing instructions in memory. *Rofheart*, 14:14-35, 13:29-65, Fig. 2.

173. A POSITA would have been motivated to modify *Zhang* to the extent not expressly taught in *Zhang* to include hardware and software such as a processor and programming instructions taught by *Rofheart* to route a media data stream of media content to a selected device via a wireless communication link for streaming the media data stream according to a streaming protocol for presentation of the media content by a media player of the selected device. Such a modification would have been combining prior art elements (e.g., processor, communication interface, software instructions) according to known methods to yield the predictable result of a mobile device (e.g., PDA) that includes a processor (“controller”) adapted to route a media data stream, as taught by *Rofheart*. *See* Section V.F where I discussed such mobile device hardware. Such a use of a known technique of using such hardware

components in mobile devices would have improved *Zhang*'s similar mobile device in the same way as *Rofheart*'s.

174. Further, *Zhang* and *Rofheart* both teach similar mobile devices (e.g., PDAs), such that modifying *Zhang* in view of *Rofheart*'s teachings would have been straightforward and would have had a reasonable expectation of success. Indeed, such prior art teachings were a known solution to a problem and would have been within the skillset of a POSITA to implement. *See* also Section V.

**P. Claim 15: The mobile apparatus of claim 14, wherein said mobile apparatus is one of a cell phone, a handheld device, and a personal digital assistant (PDA).**

175. *Zhang* teaches a mobile device including a cellular phone and PDA. *See* Claims 1, 14. *See* also Section V.

**Q. Claim 16: The mobile apparatus of claim 14, further comprising a user interface associated with said scouting detector for allowing a user to select between available compatible media handling devices to reroute said media data stream thereto.**

176. *See* Claims 5, 14(b). *Rofheart* teaches a user interface which allows a user to select between available media handling devices. *See* Claims 1, 14. Further, said user interface is associated with a scouting detector. *Id.* *Zhang-Moore* in view of *Rofheart* teaches selecting one or more of a plurality of such available compatible devices. For example, *Rofheart* teaches using a user interface of a mobile device to select one or more of a plurality of nearby devices with which to connect. A POSITA would have understood that modifying *Zhang-Moore* per *Rofheart*'s teachings

would have achieved the same benefits as *Rofheart*. Indeed, such prior art teachings were a known solution to a problem and would have been within the skillset of a POSITA to implement. *See* also Section V.

**R. Claim 18: The mobile apparatus of claim 14, wherein said controller further comprising control functionality operable to carry out said rerouting through locally available infrastructure.**

177. *See* Claim 14. *Zhang-Moore-Rofheart* use a WLAN connection between the mobile device and helper server (e.g., wireless speaker) for rerouting streaming audio. *See* Claim 1. A POSITA would have understood that the rerouting would have included control functionality (e.g., a processor and programming instructions) operable to carry out said rerouting through locally available network infrastructure (e.g., WLAN infrastructure including WLAN hardware and software for WLAN connections). Indeed, such control functionality and rerouting through local wireless infrastructure were well known in the prior art. *See* Claim 14. *See* also Section V.

**S. Claim 19: The mobile apparatus of claim 14, wherein said media content is one of voice data, bidirectional voice data, bidirectional audio data, bidirectional video data, a game session, an interactive game session, a television broadcast, and a radio broadcast.**

178. *See* Claim 14. As set forth above, the proposed *Zhang-Moore-Rofheart* combination routes an audio stream from an external source (Web server) via a local wireless communication network to a mobile device and then reroutes some or all of

that audio stream to a helper server (e.g., speaker(s)). *See* Claim 1. A POSITA would have understood that Web-based streaming audio took many forms at the time, including basic streaming music as well as radio broadcasts, and would have been motivated to ensure the system supported multiple types of streaming audio. For example, I note that U.S. Patent Pub. No. 2003/0139966 to Sirota et al. (“*Sirota*”) teaches a client device that receives streaming radio broadcast over the Internet. Indeed, like basic streaming audio, radio broadcasts often include music and would benefit from *Moore*’s process of splitting the bass components into a separate stream that played through a separate wireless speaker. In particular, radio broadcasts would still have contained low frequency (bass) signals and transmitting at least said bass signals to an external audio system would have provided full range sound, per *Moore*’s teachings.

179. A POSITA would have expected success in supporting Web-based radio broadcasts in the proposed combination. In particular, I note that *Sirota*, like *Zhang* and *Moore*, teaches streaming radio using TCP/IP, which a POSITA would have understood means there would have been no technical modifications required of the proposed modification to support streaming radio broadcasts in addition to basic streaming audio. Indeed, streaming radio broadcasts and streaming audio would have utilized the same protocol (TCP/IP), and therefore a system that supports

streaming audio would also have supported streaming radio broadcasts without requiring technical modifications.

**T. Claim 20: The mobile apparatus of claim 14, wherein said scouting detector is operable to determine media type requirements of each of said plurality of devices.**

180. *See* Claim 14. As set forth above, in response to receiving a service request from a mobile device, *Zhang*'s helper servers announce their availability to service the request. *See* Claim 1(b). *Zhang* teaches that the mobile device's service "request may contain . . . the MIME type of the user data[.]" *Zhang*, 7:1-8. A POSITA would have been familiar with MIME type—also referred to as media type—as a data field that indicates the type of media to be routed/communicated. I note that I discussed such above. *See* Claim 1(b), where I discussed *Egli* (Ex. 1015) and *Zintel* (Ex. 1016) and MIME types that indicate a type of data (e.g., audio, video, images).

181. When *Zhang*'s service request indicates a MIME type, a helper server responsively announcing its availability to service the request also announces—at least implicitly—availability for accepting a type of routed media, as claimed. I note that a POSITA would have understood such because a helper server would not accept a service request that it cannot fulfill. From this, the mapped scouting device is operable to determine media type requirements of each helper server, as claimed. Indeed, the MIME type information would have indicated the media type to a helper

server, and the helper server would have responded to a service request, thus indicating to the mobile device that the helper server is capable of servicing the service request for a particular media type. A POSITA would have understood that such would have occurred for a plurality of helper servers, as discussed above for Claim 1, because *Zhang* alone or in view of *Rofheart* teaches a plurality of helper servers.

**U. Claim 22(Pre): A computer program product for routing media data stream, said computer program product comprising:**

182. The '223 Patent teaches that its described apparatus may be “realized as software[,]” but does not elaborate further. '223 *Patent*, 8:18-24. As set forth below, a POSITA would have understood that the functions performed by the proposed combination are also governed by software or at least that it would have been obvious to implement these functions in software (“computer program product”). Indeed, as discussed below, a POSITA would have understood that implementing functions in software was known in the prior art.

***1. Zhang’s Teachings***

183. *Zhang* does not expressly teach program instructions for performing its functions. However, a POSITA would have understood that the combination’s mobile device (e.g., PDA, cell phone) would have included programming instructions and a processor for performing its functions including routing media data streams. *See* Claims 1, 14.

## ***2. Rofheart's Teachings***

184. To the extent it is argued *Zhang-Moore* does not teach program instructions for its functions, a POSITA would have been motivated to modify *Zhang-Moore* to utilize program instructions executed by a processor, per *Rofheart*. As I discuss below, *Rofheart* teaches using such program instructions to perform various functions.

185. *Rofheart* teaches a processor system 201 of a local device (e.g., PDA, mobile telephone, laptop computer) where processor system 201 performs processing steps stored in memory. *See* Claim 14(b). Thus, to the extent programming instructions are not expressly taught in *Zhang-Moore*, a POSITA would have been motivated to modify *Zhang-Moore* to include programming instructions for its functions, such as taught by *Rofheart*. Further, I note that such programming instructions would have been stored in the memory of a mobile device, per *Rofheart's* teachings.

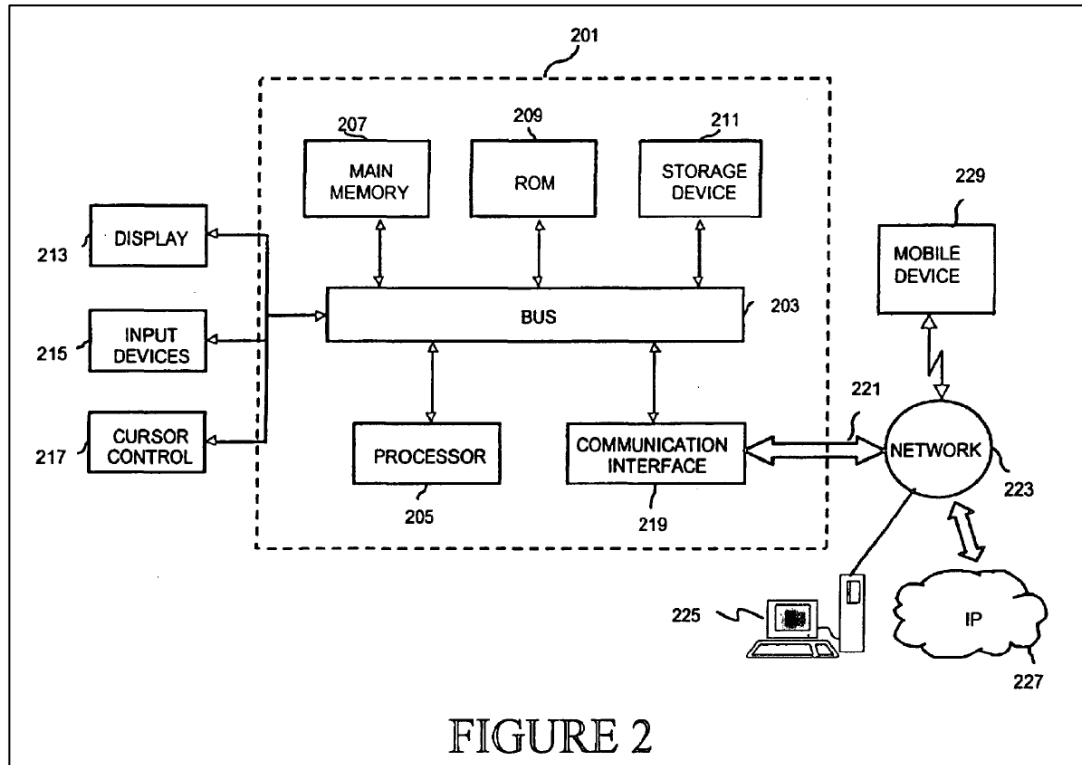
186. Using programming instructions executed by a processor to control the operations of an electronic device, such as the mobile devices in *Zhang*, was using a known technique to solve a known problem in the prior art, and such was well within the skillset of a POSITA. Such a use of a known technique would have improved *Zhang-Moore's* mobile device in the same way as *Rofheart's*, including because using programming instructions stored in memory would have allowed *Zhang-*

*Moore's* mobile device to perform numerous functions based on the stored programming instructions that would have been executed by a processor of the mobile device. Further, such a modification would have had a reasonable expectation of success because using a processor to execute programming instructions was well known and well understood, and *Zhang, Moore, and Rofheart* teach similar portable devices, such that modifying *Zhang-Moore* per *Rofheart's* teachings would have been straightforward and not required undue experimentation. I note that such a modification would have required only including relevant programming instructions in *Zhang-Moore-Rofheart's* mobile device, and that a POSITA would have understood that such was routine for mobile devices, including those taught by *Zhang, Moore, and Rofheart*.

**V. Claim 22(a): a non-transitory computer readable storage medium having stored thereon:**

187. *Zhang-Moore-Rofheart* teaches a non-transitory computer readable storage medium having program instructions stored thereon. *See* Claim 22(Pre). I also note that *Rofheart* teaches a mobile device includes “static” memory, such as ROM 209, and storage device 211, such as a magnetic disk or optical disc. *Rofheart*, 13:29-50. A POSITA would have understood that either or both of *Rofheart's* ROM (read only memory) and storage device would have been non-transitory computer readable storage medium. Indeed, such device types stored computer programming instructions or other data in a persistent manner, and as such were known to be non-

transitory. This is in contrast to memory such as common RAM (random access memory), which (without a battery or other technique) would not store programming instructions after the device is powered off, for example, and would not have been understood to be non-transitory. Indeed, *Rofheart* expressly teaches examples of “non-volatile” memory (non-transitory, e.g., “static” ROM 209, storage device 211) and “volatile” memory (transitory), such as memory 207 (e.g., RAM). *Rofheart*, 14:14-35, 13:29-65.



*Rofheart*, Fig. 2, 14:14-35, 13:29-65.

**W.Claim 22(b): first program instructions executable by a processor to wirelessly receive at a mobile device, from an external source via a local wireless communication network, a media data stream transmitted according to a streaming protocol and comprising media content selected from a group consisted of: audio content and video content;**

188. A POSITA would have understood that “program instructions” would have been program instructions either alone or part of a larger set of instructions for performing particular functions when executed by a processor. For example, *Rofheart* teaches non-transitory/non-volatile memory with program instructions for performing various functions. *Rofheart*, 14:14-35, 13:29-65. A POSITA would have understood that a specific location (or locations) in memory would not have been required, but a processor would have been able to locate instructions wherever stored in memory, such as *Rofheart*’s memory 209 or storage device 211. Thus, a POSITA would have understood the claimed “first program instructions” through “fifth program instructions” (Claim 22(b)-22(f)) are met by program instructions in a single program or multiple programs stored in one or more non-transitory computer readable memories. Indeed, regardless of the exact storage location(s) (for example, whether stored as a single set of instructions or multiple sets of instructions), such instructions would have been stored in non-volatile / non-transitory memory, such as taught by *Rofheart*. The claimed functions and non-transitory computer readable storage medium are taught in the prior art, as mapped above. See Claims 1(a), 14, 22(Pre)-22(a).

**X. Claim 22(c): second program instructions executable by the processor to scan said local wireless communication network using said mobile device to identify a plurality of devices, identified as compatible to handle said media content, said plurality of devices are wirelessly connected to said local wireless communication network and wirelessly announce an availability for accepting a routed media via said local wireless communication network;**

189. The claimed functions are taught in the prior art, as mapped above. *See* Claims 1(b), 14, 22(Pre)-22(b).

**Y. Claim 22(d): third program instructions executable by the processor to select, based on a user interaction made with said mobile device and while said media data stream is streamed to said mobile device from said external source according to said streaming protocol, one of said plurality of devices;**

190. The claimed functions are taught in the prior art, as mapped above. *See* Claims 1(c), 14, 22(Pre)-22(b).

**Z. Claim 22(e): fourth program instructions executable by the processor to set up a wireless communication link with said selected device via said local wireless communication network; and**

191. The claimed functions are taught in the prior art, as mapped above. *See* Claims 1(d), 14, 22(Pre)-22(b).

**AA. Claim 22(f): fifth program instructions executable by the processor to cause a routing of said media data stream of media content to said selected device via said wireless communication link streaming said data stream of media content according to said streaming protocol for presentation of said media content by a media player of said selected device.**

192. The claimed functions are taught in the prior art, as mapped above. *See* Claims 1(e), 14, 22(Pre)-22(b).

**X. OPINIONS REGARDING GROUND 2: CLAIMS 7 AND 13 ARE OBVIOUS OVER *ZHANG, MOORE, ROFHEART, AND THORNTON***

**A. Claim 7: The method of claim 1, further comprising transmitting said media content to a plurality of copies so as to perform said routing to a number of said plurality of devices.**

193. *See* Claim 1. A POSITA would have been motivated to modify *Zhang-Moore-Rofheart* per *Thornton*'s teachings to share media content with a plurality of devices, for example, by transmitting the audio to a plurality of speakers. I note that such would have been an advantageous modification to provide media content to a plurality of devices. *Thornton* teaches a first device displaying a presentation received from a memory or other device, for example, while transmitting said presentation to another device for display on the second device. *Thornton*, 6:26-42 (teaching audio and video sources for presentation on a first device include “data streams originating outside the system, such as pre-recorded television and live radio broadcast signals.”). *Thornton* teaches transmitting “[c]ontinuous media streams from” a first user to “the at least second device, wherein these media streams are

presented on the at least second device without the at least second device receiving input from the second user.” *Thornton*, 3:56-4:11.

194. In one embodiment, *Thornton* teaches that a first device presents a selected multimedia presentation on its display while transmitting said presentation to a second selected device to present on its display simultaneously. *Thornton*, Abstract, 9:6-34, 9:37-47 (teaching multiple devices displaying the same presentation simultaneously), 11:14-29. A POSITA would have understood that such simultaneous display on two or more devices would have been presenting multimedia to a plurality of devices.

195. Indeed, *Thornton* teaches “synchronous communication between people by integrating audiovisual content into natural conversation through coordination of such content with the activity of the individuals, especially related to a shared application or task.” *Thornton*, 5:4-54, 11:30-38 (teaching “[p]eeking” and “[s]laving” where a user can synchronize a device with another device by seeing or hearing what another user is viewing or listening to or where a user can connect to another device and “present what that user’s terminal is presenting”).

196. A POSITA would have been motivated to modify *Zhang-Moore-Rofheart* per *Thornton*’s teachings, resulting in transmitting streaming audio (as multiple copies) to multiple speakers. Such a modification would have advantageously allowed multiple devices (such as multiple speakers, a display and

speakers, or other combinations of multiple devices) to receive streaming audio. This proposed modification would advantageously allow a user to share audio content with one or more other users via one or more sessions so all the users experience the same content simultaneously via their own copy of said media. Indeed, *Thornton* teaches such is advantageous to allow multiple users to experience the same content at the same time. The proposed modification would similarly allow a user to transmit audio to multiple speakers, creating a more immersive listening experience. A POSITA would have understood such because utilizing multiple speakers or a combination of devices, such as speakers and a display, would have provided a user with more devices to present media content, including streaming audio. Such a modification would have been use of a known technique of copying media content and routing the content to a plurality of devices and that such would have improved *Zhang-Moore-Rofheart*'s similar system in the same way as *Thornton*.

197. The proposed modification would have also had a reasonable expectation of success because *Zhang-Moore-Rofheart* already teaches receiving and presenting content at a first device and sharing content to at least a second device, and modifying *Zhang-Moore-Rofheart* such that the same content is copied and transmitted to a plurality of devices would have been a straightforward modification requiring only straightforward programming instruction or software changes. Indeed, a POSITA would have understood that copying content for

presentation to multiple other devices was a known solution to a problem in the prior art, as taught by *Thornton*, and that such was well within the skillset of a POSITA to implement. *See* Claim 1. Further, because such a technique was known in the prior art, per *Thornton's* teachings, modifying *Zhang-Moore-Rofheart* would not have required undue experimentation.

**B. Claim 13: The method of claim 1, wherein before said causing said media data stream is constantly received and presented by said mobile device while being delivered by said external source before said scanning is performed.**

198. *See* Claim 1. *Zhang-Moore* teaches receiving a media data stream from an external source, but does not expressly teach a media data stream is constantly received and presented while being delivered by an external source. *See* Claim 7 (mapping *Thornton's* synchronous and continuous media streams presented on multiple devices at the same time).

199. A POSITA would have understood that such a modification would have resulted in a media data stream being constantly received at a mobile device and presented by the mobile device while being delivered from an external source before the mobile device scans for available devices to which to stream said media. I note that a mobile device receiving content and presenting said content was known in the prior art, including as taught by *Zhang-Moore-Rofheart*, and that such content would have been received including before scanning for helper servers to which to transmit said content (e.g., streaming audio). A POSITA would have been motivated to

modify *Zhang-Moore-Rofheart* per *Thornton*'s teachings to advantageously allow a user to share audio and/or video content with one or more other users via one or more sessions so all the users experience the same content simultaneously. I note that such would have been advantageous for the reasons discussed above. See Claim 7 (discussing *Thornton*'s advantages). Indeed, such a modification would have been use of a known technique of a media data stream being constantly received and presented at a first device while being delivered from an external source (e.g., live radio broadcast or other streaming audio) and then transmitting said media content to at least a second device for the second device to present simultaneously and would have improved *Zhang-Moore-Rofheart* in the same way as *Thornton*. Such would have advantageously allowed multiple devices to experience the same content simultaneously. Further, such would have provided a user with control over whether to stream content to one or more helper servers (including choosing which helper servers to which to stream content).

200. Such a modification would have had a reasonable expectation of success because *Zhang-Moore-Rofheart* already teaches receiving and presenting content at a first device and sharing content to at least a second device, and modifying *Zhang-Moore-Rofheart* such that the content is constantly received and presented while being delivered would have been a straightforward modification requiring only straightforward programming instruction or software changes. See

Claim 1. Further, because such a technique was known and well within the skillset of a POSITA, per *Thornton's* teachings, modifying *Zhang-Moore-Rofheart* would not have required undue experimentation.

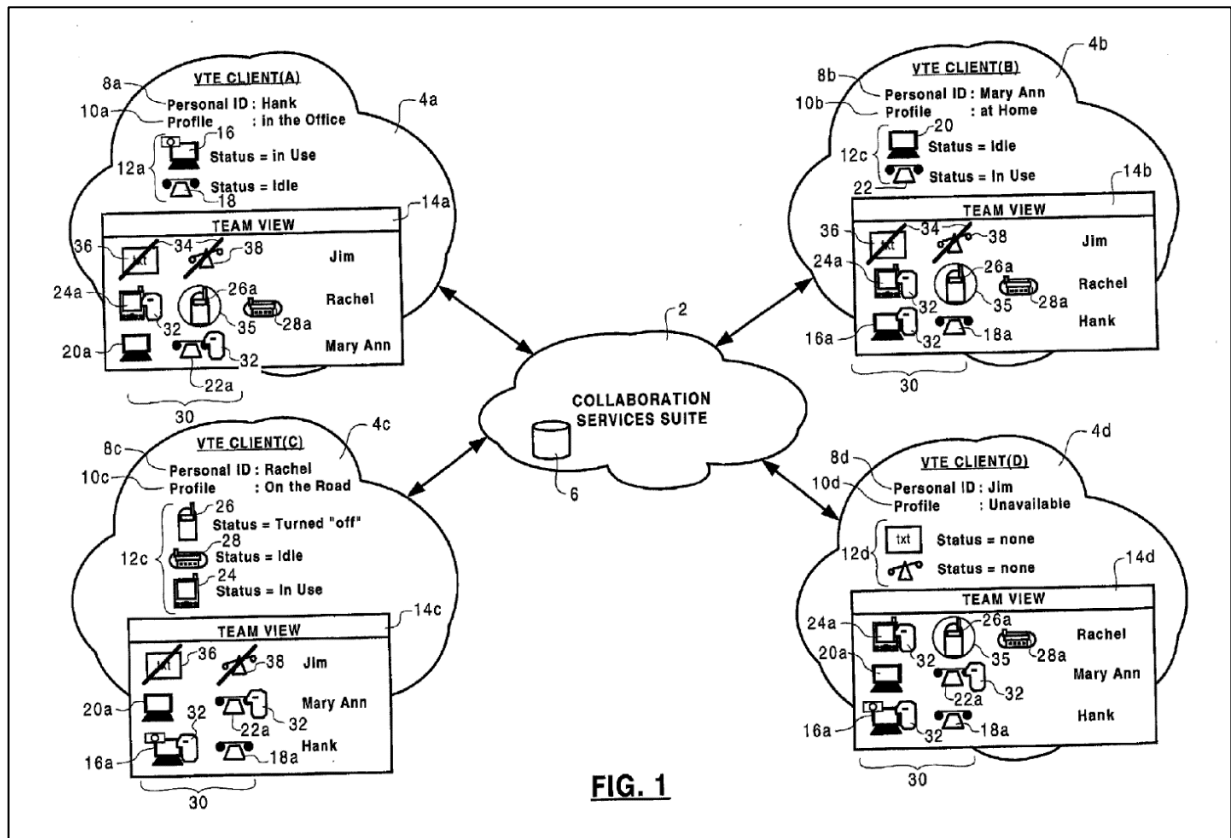
**XI. OPINIONS REGARDING GROUND 3: CLAIM 9 IS OBVIOUS OVER ZHANG, MOORE, ROFHEART, AND LIVERSIDGE**

**A. Claim 9: The method of claim 1, wherein said selecting comprises carrying out a selection between devices found to be available, based on a predetermined user profile.**

201. *Liversidge* teaches a user profile that includes a plurality of devices associated with a particular user and which can be used for communicating with said user. *Liversidge*, [0017], [0020]. For example, such devices include a wireless PDA 24, wireless telephone 26, two-way pager 28, and personal computers (PCs) including notebook PCs. *Liversidge*, [0062]-[0065], [0070], [0076], [0078]-[0079], [0108]. Each user has a personal profile 10 and communications information 12 that indicates the availability of each user for participating in communications. *Liversidge*, [0062]. In one embodiment, user Hank has a “personal profile 10a indicating that he is currently working in his office.” *Id.* The personal profile 10a provides “communications information 12a identifying his office personal computer (PC) 16 (which includes two-way video conferencing capability) and his office telephone 18 as communications devices through which he prefers to receive communications.” *Id.* Similarly, other users (e.g., Mary, Rachel, Jim) have

respective personal profiles indicating a location and communications information indicating devices with which the user prefers to communicate at said location. *Id.*

Fig. 1 below depicts said users, personal profiles, and communications information:



*Liversidge*, Fig. 1.

202. *Liversidge* further teaches users define one or more personal profiles 10, “each of which contains respective communications preferences information defining the user’s preferences relating to participation in communications with other team members.” *Liversidge*, [0088]-[0090]. Such profiles relate to an environment or a context, such as “in the office[,]” “mobile[,]” and working at

home[.]” *Id.* Further, *Liversidge* teaches profiles are “previously defined” and may be created, edited, and/or deleted to “define respective communications preferences of the user.” *Liversidge*, [0090]-[0094]. Additionally, a user may select different profiles for different teams, where one team sees a particular availability while another team sees unavailability, for example. *Liversidge*, [0097]. A POSITA would have understood that such profiles would have been “predetermined” because they are predefined and stored. *Thornton*, [0090]-[0091] (including teaching creating and editing previously created profiles). For example, such profiles would have been stored in memory, for example, such as a non-volatile memory (e.g., such as taught by *Rofheart*, 14:14-35, 13:29-65), so that a user would not have had to create profiles every time the device powers on. Further, a POSITA would have understood that selecting among said devices would have included selecting between devices found to be available because *Liversidge* teaches indicating availability and unavailability of groups of devices for communications based on the current user profile. Indeed, *Liversidge* teaches indicating availability and unavailability of particular devices based on the current user profile that a user has selected, which indicates that certain devices are either available or unavailable.

203. A POSITA would have been motivated to modify *Zhang-Moore-Rofheart* in view of *Liversidge* to use *Liversidge*’s known technique of using predetermined user profiles to indicate availability of one or more communications

devices so that a user would select a device that is currently available for communications to improve *Zhang-Moore-Rofheart's* similar communications system in the same way as *Liversidge's* system. Such a modification would have aided a user in selecting devices that are available for use as helper servers. Indeed, such a modification to utilize predetermined user profiles would have advantageously signaled which devices were available to connect to based on particular locations or particular users, for example, allowing a user easier and more specific selections for devices with which to communicate. Such a modification would have increased user control over which helper server(s) to select to connect to for streaming media, for example. Such a modification would have been especially advantageous to enhance organization for how available devices are presented to a user especially in environments where a large number of devices are available. In some environments, such as an office building, a large number of devices may be available, and utilizing *Liversidge's* teachings in the *Zhang* combination would have helped a user avoid choosing a device that is not actually available to connect with or would have simplified the search results for a user. Similarly, if a user selects a particular profile to search for only a certain type of helper server (e.g., speakers), then devices other than the particular type of helper server (e.g., speakers) would not need to be displayed to the user, advantageously improving the modified *Zhang's* system. Indeed, such a modification would have

enhanced the efficiency of a user's selections and ease of use of the modified *Zhang-Moore-Rofheart* system.

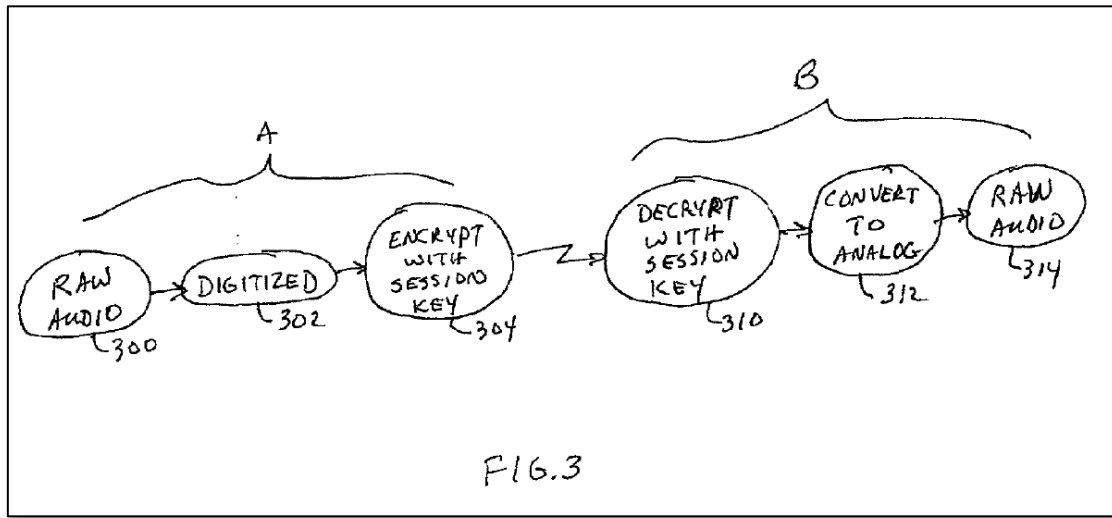
204. Such a modification would have had a reasonable expectation of success because grouping available devices based on predetermine profiles was known, per *Liversidge's* teachings, and because such a modification would have been straightforward, requiring only minor software or other programming instruction changes to implement. As discussed above, such programming instructions were well known in the prior art. *See* Claim 22, Claim 1.

## **XII. OPINIONS REGARDING GROUND 4: CLAIM 10 IS OBVIOUS OVER ZHANG, MOORE, ROFHEART, AND ANGELO**

### **A. Claim 10: The method of claim 1, further comprising encrypting said media data stream of media content before routing to said selected device.**

205. *See* Claim 1. To the extent it is argued *Zhang-Moore-Rofheart's* teaching relating to encryption is not sufficient, *Angelo* teaches secured transmission of audio (e.g., voice), video, or a combination of audio and video communicated between portable devices utilizing encryption. *Angelo*, Abstract, [0004], [0009]-[0010], [0016]-[0021], [0029], [0031]. In particular, *Angelo* teaches encrypting real-time, two-way communications between portable devices such as PDAs. *Angelo*, [0009]-[0010], [0015] (including teaching direct and indirect connections between devices and that real-time indicates not introducing delays that interfere with the usefulness of the audio stream, for example), [0016]-[0021]. *Angelo* teaches using

“[a]ny suitable type of real-time encryption technique” such as using a “session key.” *Angelo*, [0022]-[0026]. *Angelo* teaches enhancing security by dynamically changing the session key during communications. *Angelo*, [0027]. Fig. 3 below depicts a real-time encryption process between two devices. *Angelo*, [0014], [0025].



*Angelo*, Fig. 3.

206. A POSITA would have been motivated to modify *Zhang-Moore-Rofheart* per *Angelo*'s teachings to capture *Angelo*'s advantages including the expressly taught advantage of providing a secure environment for communications between portable devices so that “information cannot be intercepted and accessed by an unauthorized entity, or at least not easily accessed by an unauthorized entity.” *Angelo*, [0007]-[0010]. Such a use of a known technique of encrypting communications between portable devices would have advantageously improved *Zhang-Moore-Rofheart*'s similar system in the same way as *Angelo*'s. Indeed, a

POSITA would have understood that such a modification would have been advantageous to prevent or at least make it more difficult for an unauthorized entity to view content streamed between devices. For example, a user may not want a neighbor, coworker, or in particular a malicious user to access the streaming content a user sends to a helper server in the *Zhang* combination.

207. A POSITA would have had a reasonable expectation of success when making such a modification to implement encryption because *Angelo* teaches such a technique and because *Rofheart* teaches secure communications. Further modifying *Zhang-Moore-Rofheart* per *Angelo* would have predictably enhanced such security to cover audio, voice, video, or a combination of audio/video with encryption. Indeed, a POSITA would have expected that such security would have been useful regardless of the type of media transmitted between devices. Such a modification would have required only minor modifications, including changes to software or other programming instructions to utilize *Angelo*'s security software 108 executed by a processor to provide encryption functionality. *See also Angelo*, [0019], [0025], which teaches storing software in non-volatile memory and that the software is executed by a processor (e.g., CPU). As discussed above, *Rofheart* teaches non-volatile memory for storing programming instructions. *See Claim 22*. Thus, such a modification would have been well within the skillset of a POSITA and would not have required undue experimentation to implement. Indeed, a POSITA merely

would have included security software, such as taught by *Angelo*, in the *Zhang* combination (which includes a processor and non-volatile memory) to achieve *Angelo's* advantages with a reasonable expectation of success.

Declaration of Dr. Sayfe Kiaei  
Patent No. 9,699,223

### **XIII. CONCLUSION**

208. I hereby declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct, and that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I understand that willful false statements are punishable by fine or imprisonment or both. *See* 18 U.S.C. § 1001. If called to testify as to the truth of the matters stated herein, I could and would testify competently.

Date: July 3, 2024

Respectfully submitted:



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Dr. Sayfe Kiaei

# Exhibit A

**Dr. Sayfe Kiaei**  
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[Sayfe@asu.edu](mailto:Sayfe@asu.edu)

*Sayfe Kiaei*

**Professor, Motorola Endowed Chair Professor**

**School of Electrical, Computer and Energy Engineering, Arizona State University, Tempe, AZ**

**FIELDS OF SPECIALIZATION**

- **Integrated Circuits (IC), Radio Frequency**, Analog & Digital IC, Mixed-Signal IC, VLSI, Processor, ASIC, RFIC, Receiver, Transmitter, Synthesizer, RF system, VLSI, Processor, DSP processor
- **Power Management**: Power Management IC, Battery Management, Energy System, Energy Management
- **Sensors & Bioelectronics**: RFID, ZIGBEE, Bluetooth, Biosensors, Hearing Aid sensors, Implanted devices electronics, Medical Implanted Communication System (MICS)
- **Signal Processing**: Digital Signal Processing, Adaptive Signal Processing, Video & Audio Signal Processing, Adaptive Audio Array processing, Audio and Acoustic & Speech processing.
- **Communication Systems**: 1G-5G, 2-way radio, BT, WIFI, Sensors, ZIGBEE, wireless sensors, CABLE, DSL, Optical

**DEGREES**

- **Ph.D.**, Electrical and Computer Engineering, Washington State University, 1987
- **M.S.**, Electrical and Computer Engineering, Washington State University, 1984
- **B.S.E.E.**, Electrical Engineering, Northeastern University, Washington State University, 1982

**ACADEMIC POSITIONS**

**Fall 2001-Present: Professor, Motorola Endowed Chair Professor in Analog and RFIC School of Electrical, Computer and Energy Engineering, Arizona State University, Tempe, AZ**

- **Research Projects:**
  - Integrated Circuits: Analog and digital IC, Radio Frequency IC, RF transceiver, VLSI, Processor System Architecture, ASIC
  - Power Management IC, Battery Management & Sensing, Integrated Power Electronics
  - Sensors, Bioelectronics, Biosensors, Hearing Aid Electronics, Implanted devices electronics
  - Digital Signal Processing, Audio processing, adaptive signal processing, Array processing, Adaptive Audio Array processing, Audio and Acoustic & Speech processing,
  - Communication system, 1G, 2G GSM, 3G (UMTA, WBCDMA), 4G LTE, 5G, wireless mobile system, LTE, WiFi, Bluetooth, Wireless system standards, MODEM standards, CABLE MODEM DOCIS, DSL
- Research Funded by NSF, USAID, DARPA, JPL, NASA, Motorola Inc., Intel Inc., Broadcom, Qualcomm, Raytheon, General Dynamics, Texas Instruments, and over 10 other industries.

**2004-2020, Director and founder of NSF IUCRC Center Connection One**, School of Electrical, Computer, and Energy Engineering, Arizona State University, Tempe, AZ; <https://connectionone.org>

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- The NSF Connection One Industry/University Cooperative Research Center was established the center in 2002 with focus on communication system, integrated Circuits and Systems, wireless system, RF, sensors, and related areas. The center has five university member with over 30 industrial members. Total funding over \$10M.

**2021-Present, Director and PI, USAID, Center of Excellence for Energy (COE) in Egypt , Funding \$22.5M**

- Director and PI: COE - Energy Center funded by the USAID.
  - USIAD Centers of Excellence for Energy (COE) - established the Center of Excellence for Energy (COE/E) in Egypt with funding and support from the United States Agency for International Development (USAID/Egypt) in November 2021. COE/E is a partnership between ASU-US and three Egyptian partner universities (EPUs): Ain Shams University (ASU-EG), Aswan University (AU), and Mansoura University (MU).

**2014-2020, Director, USAID, US-PCASE: Center for Advance Studies in Energy, Funding \$18M.**

<https://uspcase.asu.edu/>

- **Director and PI:** PCASE - Partnership Center for Energy systems, Energy Center funded by the USAID.
- USIAD Centers for Advanced Studies in Energy program (USPCAS-E) is a partnership between Arizona State University and two leading Pakistani universities: the National University of Science and Technology (NUST) Islamabad and the University of Engineering and Technology in Peshawar (UET).
- PCASE has developed two new Graduate schools of Energy. Within 5 years, the center has over 1000 MS and PHD Students, with 14 new energy degrees in MS and PhD, two new building with 20+ energy labs in the power system, grid, power electronics, renewable energy, PV, Wind, Hydro, bio-fuel, fuel cell, batteries and storage, and thermal areas.

**2008-2012: Associate Dean of Research, Ira A. Fulton Schools of Engineering, Arizona State University**

Responsible for leading the research infrastructure, promoting and developing research programs with industry and federal agencies, leading large multi-university proposals, investing and providing seed funding to foster new research areas, and promoting graduate program in the college of engineering. Research Enterprise support included:

- Increase College of Engineering research funding from \$50M to over \$80M.
- Working with Vice President for Research, Dean's, and directors on University-wide research initiatives.
- Established the first NSF Engineering Research Center (ERC) at the ASU on Solar Energy QESST. Managed, organized and planned the ERC proposal process. ASU is the lead school partnering with MIT, Georgia Tech, U of Delaware, Cal-Tech, U of New Mexico, and UA.
- Lead several trans-disciplinary 4M research projects (4M: multi-million, multi-investigator, multi-disciplinary, multi-university grants) in energy, security, and related initiatives.
- Oversight of over 20 existing research centers in the college of Engineering.
- Engage with industry and federal government to establish new research collaborations.
- Organized workshops and supported proposals for NSF, NIH, DOE, DOD, DARPA, etc.
- Organized workshops for new assistant professors to apply for NSF CAREER Awards. ASU CAREER awards grew from 3 annual awards in 2008 to over 15 CAREER awards by 2012.
- Research Administration and pre-award proposal administration for the schools. Developed a decentralized research administration and advancement team for the Schools supporting 5 schools, 12 departments, over 220 engineering faculty, with funding over \$70M.

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- Annual budget over \$7M for supporting research centers, seed funding for new center, cost sharing, proposal support, equipment and infrastructure support, graduate scholarships, and research administration.
- ADR Staffs included, Director of industrial and government liaison, Director of research administration, and 14 research advancement staff.
- Graduate Programs: Recruiting, Fellowships, marketing, outreach, coordination with departments

**1997-2001, Adjunct Professor, Electrical and Computer Engineering Dept., The University of Texas, Austin, Texas,** Taught graduate courses at UT Austin on Introduction to Telecommunication System and Digital Communications. Co-advised two Ph.D. program committees in IC design and Telecomm (while at Motorola)

**1987-1993, NSF Center For Digital / Analog IC (CDADIC) Co-Director,** NSF IUCRC Center director at Oregon State University. The CDADIC was established the center in 1987 with focus on integrated circuits at WSU, UW, and OSU with over 20 industrial members - <https://cdadic.oregonstate.edu/>

**1987-1993, Assistant / Associate Professor (Tenured) Electrical and Computer Engineering Department, Oregon State University, Corvallis, OR**

- Research and classes in Electronics, DSP, Communication system and networks, Wireless systems, MODEMS. Graduated 30 MS and Ph.D. students.
- Faculty Chair, Computer Engineering Program, Developed a new Computer Engineering Program at OSU in 1987

### **INDUSTRIAL POSITIONS**

**1993-2001: Motorola Inc., Senior Member of Technical Staff, Personal Communication Sector, Austin, Texas** - Worked projects related to wireless communications, two-way push-to-talk radios, wireless networks, ADSL and MODEM RF, and related areas.

- **Motorola Cellular Division, Wireless Technology Center (WITC), 1997-2002.** Responsible for development of integrated circuits and systems for wireless handset. Lead number of projects including cellular (2G, 3G, 4G), wireless connectivity (Bluetooth and WIFI transceiver), GPS and location Receiver, wireless networks, 2-way radios and related areas. Worked on the development of various subcomponents including system design, link budget, RF front-end, RF receiver, RF transmitter, digital audio processing, audio processing, DSP, frequency synthesizer, ADC, DAC, filtering, analog front-end, power management, battery management, and baseband processor, baseband circuits and systems.
- **Motorola Semi-conductor products sector (SPS), Broadband Products Operations, 1995-1997,** Worked on the development of XDSL (ADSL, VDSL, G.lite), MODEM, and Optical broadband communication systems including OFDM, modulation, synchronization, equalization and the development of a single chip ADSL transceiver (*CopperGold™*). The transceiver contained Analog Front End (A/D, D/A, Hybrid), custom DSP, baseband processor, DMT, modulation/demodulation, FFT, IFFT, echo canceler, time domain equalizer, front-end constellation mapping, Trellis code modulation, Viterbi decoder), audio processing, DSP, signal processing, and an on-chip DSP core.
- **Land Mobile Products Sector LMPS 1993-1995,** Responsible for Wireless digital two-way radios, developed RFIC, RF receiver, RF transmitter, digital audio processing, audio custom IC, DSP, frequency

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synthesizer, ADC, DAC, hot spot wireless network, next generation of digital two-way radios, "Talk about Radios", Japanese cellular systems (PHS).

- **Standards**, Represented Motorola in various standards including 2G-4G, GPS, Bluetooth working group, WiFi, 802.11, and DSL standards including T1E1, International Telecommunication Unit (ITU), T1E1, ETSI, 3GPPP, Universal ADSL Working Group (UAWG), Bluetooth working group, G.Lite working group, etc.
- **University relations**, Responsible for the development of collaborative research programs with several universities. Responsible for funding research in the areas of Wireless Transceiver IC Design, RF, and mixed-signal and baseband system architecture.

**1985-87: Member of Research Staff, Boeing Co.,** Bellevue, Wa, Flight Systems Research and Technology Center, summer. Design Engineer, Hardware and CAD tool development for system control.

### **AWARDS**

- IEEE Fellow 2004-Present
- IEEE Fellows CAS Committee Chair, 2009-2012
- Global Standards Award, For contributions in the International Telecommunication Unit (ITU) for Asymmetric Digital Subscriber Line (ADSL) G.Lite Standards. Motorola Inc., 1999.
- 10X Cycle Reduction Award, for development of new IC design process from DSP algorithm to IC layout, Motorola Inc., 1995.
- IEEE Darlington best paper Award, IEEE Circuits and Systems Society Best Paper Award, 1995. For "Characterization and Comparison of CMOS FSCL Circuits with Conventional CMOS for mixed-signal ICs," Published at: *IEEE Trans. on Circuits and Systems II*, Sept. 93.
- Carter Best Teaching Award, College of Engineering Best Teacher Award, Oregon State University, 1992. For "*outstanding and inspirational teaching in the College of Engineering*". Award is selected by the confidential vote of all of the undergraduate students in the College of Engineering among over 125 professors in the College.
- Industrial University Fellowship (IUF) Award, National Science Foundation, 1993.
- Research Initiation Award, National Science Foundation, 1990-93.
- Outstanding Graduate Student Scholarship, Azur-Data Inc. WSU, 1984

### **RESEARCH PROJECTS**

#### **Partial list of Research Awards (1987-Present):**

- **2021-2026 – COE – Center of Excellence for Energy, U.S. Agency for International Development (USAID)**
  - PI and Director, \$22.5M.

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- **2020-2022 - Center for Next Generation Wireless Spectrum Sharing (5-6G Spectral sharing) The National Science Foundation (NSF)**
  - SII Planning, PI, \$300K.
- **2002-2020 – Industry/University Cooperative Research Center (IUCRC), The National Science Foundation (NSF) - Connection One**
  - NSF contribution \$1.5M.
  - Annual Industry Contribution: Total over \$7M.
- **2015-2016 – Integration of Smart Dynamic Optical Communication, The National Science Foundation (NSF)**
  - Integration of Smart Dynamic Optical Communication Networks for Intelligent Distribution of Power Workload and Data in Disaster, \$200K
- **2015-2020 – U.S. Agency for International Development (USAID)**
  - PCASE – Center for Energy systems, PI and Director, \$18M.
- **2013-2014 Arizona Space Grant Consortium, NASA**
  - Goddard Space Flight Center, RADHARD electronics, \$200K
- **2012-2015 – Solar Energy, Private Donor**
  - Solar Energy Development on international projects, \$2M
- **2011-2014 – Self-Characterization for Calibration MEMS Sensors, Semi-Conductor Research Corporation**
  - Self-Characterization for Calibration and Process Feedback of MEMS Devices, bio-sensor , \$300K
- **2011-2013 - Bio-Sensors for Vital Signs Monitoring Device Design, The National Science Foundation (NSF)**
  - Remote wireless Bio-Sensors for Vital Signs Monitoring Device Design, \$250K
- **2010-2011 – Adaptive Compensation of Analog circuits, The National Science Foundation**
  - Adaptive Compensation of Analog circuits imperfections using DSP methods, \$150K,
- **2010-2011 – Adaptive Self-Healing Wireless Sensor, The National Science Foundation**
  - Autonomous Self-Healing Sensor Network Radio and Mixed-Signal Readout System Design National Science Foundation (NSF), \$300K
- **2010-2020 – Solar Testbed, The National Science Foundation (NSF), \$45M (**
  - QESST NSF ERC Center on Solar Energy, Testbed Director
- **2010-2015 – REU, undergraduate research projects, The National Science Foundation (NSF)**
  - Research Experience for Undergraduate Students, projects: adaptive audio, Glucose Amp-meter and impedeometer, total \$400K
- **2008-2013 - Solar System, The Science Foundation of Arizona (SFAZ)**
  - PEPER- Photovoltaic Environmental Performance and Reliability for the Arizona-Wide Electric Grid, \$1.2M.

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- **2008-2009 - Medically implanted bio-sensor, The National Science Foundation (NSF)**
  - Medically implanted bio-sensor, wireless implanted bio-sensors, Wireless Glucose sensors, MICS, \$200K
- **2007-2011 – MEMS implanted hearing aid and bio-sensors, The National Science Foundation (NSF)**
  - Micro-Power Multi-Phase on-chip MEMS Hearing Aid, Adaptive hearing aid audio processor, 2007-2011, \$500K.
- **2007-2009 – Implantable Bio-Sensors, The National Science Foundation (NSF)**
  - High Efficiency Power Delivery and Front-End Module Design for Implantable Bio-Sensors \$480K
- **2005-2009 - MIMO Wireless network, The National Science Foundation (NSF)**
  - Cognitive MIMO Communications for Dynamic-Spectrum Wireless Networks \$150K
- **2005-2009 - Radio Network, The National Science Foundation (NSF)**
  - Autonomous Self-Healing Sensor Network Radio, , \$250K
- **2005-2008 Integrated LiDAR on a chip, BAE Systems**
  - Integrated on-chip Time Measurement Circuits LiDAR; \$650K
- **2005-2008 – Power Management Circuits, Freescale Semiconductor**
  - PWM, Battery & Power management, \$150K
- **2005-2006 – RADHARD Electronics, DOD: Defense Advanced Research Projects Agency (DARPA)**
  - Radhard by Design - MRC/DARPA, Total funding \$1.5M
- **2005-2010 - Wireless Integrated Nano Technology Center, State of Arizona**
  - WINTECH- Wireless Integrated Nano Technology Center Support, 450K annually, total \$2.5M
- **2004-2005 – RFIC, NASA**
  - Integration of Ultra-Low power RF CMOS, \$127K
- **2004-2008 – Implanted Neural-Enabled Prostheses bio-sensor, Deference Advance Research Project Agency (DARPA)**
  - Implanted Neural-Enabled Prostheses biosensor with Sensorimotor Integration, \$500K
- **2004-2008 – NEMS RF Filters, Deference Advance Research Project Agency (DARPA)**
  - Nano-Mechanical RF Band pass resonator for 2GHZ RF Applications, with JPL, \$2.2 M,
- **2003-2005 - Imllanted Neuro-Sensor, DOD-ARMY-ARL: Army Research Office (ARO)**
  - Implanted Neuro-sensor, \$175K
- **2002-2005 – RFIC, WiFi, Intel Corporation**
  - Design of Multi-Standard RF Front-End Circuits for Cellular and WiFi, \$300K
- **2002 – Geo-location, GPS, SRC**
  - LOW POWER ULTRA - WIDE BAND GEOLACTION SYSTEMS, \$65K.
- **2001-2003 – UWB, WIFI, SRC (Semi-conductors research Corp)**

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- Ultra-Wideband Transceivers for cellular and WiFi 802.11, \$225K
- **1987-1993 - Design of Analog/Digital IC's, The National Science Foundation**
  - Center for the Design of Analog/Digital IC's ( CDADIC) 1987-1995, At Oregon State, \$1.5M
- **1992-1994 – RFIC, Motorola Land Mobile Products Sector, LMPS**
  - Low Power IF processing for Direct Digital Transceivers, \$100K,
- **1993 – Mixed-Signal IC, Hewlett-Packard**
  - Hewlett-Packard Faculty Chair position in Mixed-Signal IC, HP, \$500K
- **1992-1993 - Faculty industry Fellowships, The National Science Foundation**
  - National Science Foundation, Motorola Inc. Faculty Industry Fellowship, \$250K,
- **1992-1993 - Research Initiation Award (RIA) , The National Science Foundation**
  - National Science Foundation, Research Initiation Award (RIA) (same as current CAREER Award), Synthesis and Automatic Derivation of Multi-Rate VLSI Arrays for DSP Algorithms, \$320K.
- **1988-1992 – Center for the Design of Analog/Digital IC's ( CDADIC)**
  - CDADIC, various projects on Low-Noise Source Coupled Logic (SCL), Mixed-Mode IC's, CDADIC \$350K.
- **1988- Spectrum and time analyzers, Tektronix Inc.**
  - Decimation Filters for A/D Noise Enhancements, Tektronix, Inc., \$100K,
- **1987-1993 – DARPA, MOSIS, Tektronix, IT, Motorola**
  - Various grants for IC Fabrication (DARPA/MOSIS, VLSI)
  - Testing equipment (Tek, HP)
  - DSP system development (TI, Motorola)

**PROFESSIONAL RECOGNITION**

- IEEE Fellow, 2004-Present
- IEEE Fellow Committee Chair, CAS, 2008-2010
- IEEE Fellow Committee member, 2007-2010.
- IEEE Senior Member, 1993-Present, IEEE Member 1987-1992.
- IEEE Faculty Advisor, Oregon State University, 1987-1990

**IEEE Editorials**

- IEEE Microwave Magazine, Editor,
- IEEE System Journal, Associate Editor, 2010-2011.
- IEEE Transactions on VLSI, Associate Editor, Jan 2001-2008.

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- IEEE Communication Magazine, Editor, Feature Issues on “Circuits for Wireless and Wireline Communications,” April 1999.
- IEEE Transactions on Microwave Theory and Techniques , editor, Special Issue on: "Radio Frequency IC Design,” Dec. 1998.
- IEEE Transactions on Circuits and Systems-II, editor, Special Issue on: “Low-Power Wireless Communication Systems,” June 1997.
- Associate Editor, IEEE Transactions on Circuits and Systems-II, 1993-1996.
- *Editor and Reviewer for many IEEE journals and conferences*
- *Founding member of IEEE RF Integrated Circuits Symposium*
- *Associate Editor, IEEE Communications, Tutorial & Surveys Magazine, 2006-2009.*

**Conference Organizations**

- RFIC Executive Committee members, 2000-2017
- RFIC Steering Committee Member, RFIC symposium, 1996-2017.
- RFIC Founding member, 1995-96.
- Technical Program Chair, IEEE International Sym. on Circuits and Systems, Phoenix, AZ, 2002.
- ISSCC Admin Council, Conferences Committee 2000-2005.
- General Chair, Radio Frequency IC (RFIC) Symposium, Seattle, WA, 2002.
- Technical Program Chair, RFIC Symposium, Phoenix, AZ, 2001.
- Finance Chair, RFIC symposium, Boston, MA, 2000.
- Publicity Chair, RFIC symposium, Los Angeles, CA, 1999.
- Transactions Chair, RFIC symposium, Baltimore, MD, 1998.
- General Chair, Int. Sym. on Low-Power Electronics and Design (ISLPED), Bio-Sensors, Monterey, CA, 97.
- Executive Committee Member, Int. Symp. On Low-Power Electronics and Design, 96-2000.
- Technical Program Committee Member of the following conferences:
  - International Conference on Circuits and Systems: 1996, 2000, 2001, 2004-2008
  - RFIC Symposium, 1996-2018
  - Application Specific Array Processing (ASAP): 2000-2002
  - Technical Program Chair, Int. Sym. on Low-Power Electronics and Design, Monterey, CA, 96.
  - Arizona Telecom Comm (ATIC)
  - GLS VLSI 1998, Lafayette, Louisiana, 1998
  - VLSI Design 98, Chennai, India, Jan. 1998.
  - ICECS, Lisbon, Portugal, 98.
  - Application Specific Array Processing, 1995-97, 2000
  - Vehicular Technology Conference, 1995-97.

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- Inter. Conf. on Intelligent Information Systems, D.C., 1994-95.
- IEEE Pacific Rim Conference on Communications & Computers, Victoria, BC, Canada, 1991.

**Invited talks, Panelist, Session Chairs, Workshop Speaker**

- Conference chair, Technical Program committee chair and TPC member, tutorials, workshops, session chair, etc. in RFIC, ISSCC, ISCAS, VLSI, ICASSP, Low-Power Symposium, ICC, Application Specific IC's, IMS, MTT, etc.

**CONSULTANT**

- Medtronic's, Analog bio-sensors, MICS, 2005.
- Intel Inc. Chandler, AZ, 2002-2006: Development of 3G-4G Wireless transceiver.
- Sony Inc., San Diego, CA and Tokyo, Japan, 2002-2004: Review and development of various telecom cellular system architecture including 3G system architecture, and GPS system.
- Motorola Inc. 2002-2005: Supporting development of BT, WiFi, E911, GPS integrated circuits and systems for the cellular and mobile handsets.
- Hewlett Packard, Corvallis, OR – 1990-1993: Various project on development of custom analog and digital IC's for printer and inkjet system. Some of this work was under consultation, and some under various research grants with Oregon State University.
- Tektronix Inc, Beaverton, OR - 1988-1990: Design and Implementation of Data acquisition system for Spectrum analyzer, development of custom DSP algorithm for the Tektronix spectrum analyzer including system architecture, simulation, analysis, and design of oversampled data acquisition system.
- Boeing Commercial Aircraft, BCAC, Renton, WA - 1985-1987: Development of Airplane Controller Model, Simulation and Implementation of Flight control, Model reduction, and system control.

**EXPERT WITNESS (Patent, IP)**

Patent litigation, patent validity, infringement, IPR, expert reports, deposition, testimony, and trade secrets at ITC, District court, and USPTO in the following areas (Complete list of cases available):

- **Electronics:** Analog and Digital IC, Radio Frequency Integrated Circuits RFIC, Power Management, Battery Management, PMIC
- **Bioelectronics:** Bi-sensors, Glucose monitoring system, Heart monitoring system, Hearing AID
- **Wireless communication:** 3G, 4G, 5G, OFDM, WiFi, 802.11, Bluetooth, Wireless LAN, Wi-Fi, 802.11, Bluetooth, ZIGBEE, Wireless Standards (ITU, ETSI, 3GPP, LTE) including AMPS, GSM, CDMA, WCDMA, LTE, 1G, 2G, 3G, 4G, BT, WiFi (802.11), Satellite communications, Satellite Transceiver, ECHO and Multi-path cancellation
- **Wireline Communications:** MODEM, Digital Subscriber Line, ADSL, VDSL, MODEM, Wireline standards including DSL, MODEM and DOCSIS, and related standards ITU/ETSI
- **GPS & Location:** GPS system, GPS receiver, location determination

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- **MEMS:** MEMS, Bulk Acoustic Wave Filters, SAW, MEMS resonators, MEMS sensors, MEMS accelerometer
- **Signal processing & Communication:** Audio and acoustic signal processing, Audio Array processing, adaptive signal processing, Communication networks, Communication system

## **PATENTS, PUBLICATIONS**

### **Patents and Patent Applications**

| id               | title                                                                               | assignee                                                                    | inventor/author                                      |
|------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|------------------------------------------------------|
| AU-2003222007-A8 | Oscillator frequency correction in gps signal acquisition                           | Motorola Inc                                                                | Sayfe Kiaei, Thomas M King, George J Geier           |
| WO-03093858-A3   | Oscillator frequency correction in gps signal acquisition                           | Motorola Inc                                                                | Thomas M King, George J Geier, Sayfe Kiaei           |
| WO-2004048909-A3 | Compressed vector-based spectral analysis method and system for nonlinear rf blocks | Univ Arizona, Shahin Farahani, Sayfe Kiaei, Nazanin Darbanian               | Shahin Farahani, Sayfe Kiaei, Nazanin Darbanian      |
| US-2006226909-A1 | Monolithic supply-modulated rf power amplifier and dc-dc power converter ic         | Siamak Abedinpour, Sayfe Kiaei                                              | Siamak Abedinpour, Sayfe Kiaei                       |
| US-7218085-B2    | Integrated ZVS synchronous buck DC-DC converter with adaptive control               | Arizona Board Of Regents                                                    | Siamak Abedinpour, Sayfe Kiaei                       |
| US-7372333-B2    | Monolithic supply-modulated RF power amplifier and DC-DC power converter IC         | Arizona Board Of Regents, Acting For And On Behalf Of Arizona State Univers | Siamak Abedinpour, Sayfe Kiaei                       |
| US-7528754-B1    | Finite impulse response digital to analog converter                                 | Arizona Board Of Regents                                                    | Bertan Bakaloglu, Sayfe Kiaei, Shahin Taleie         |
| US-2018049703-A1 | Wireless in-shoe physical activity monitoring                                       | Timothy W. Markison, Sayfe Kiaei, Gary McCoy                                | Timothy W. Markison, Sayfe Kiaei, Gary McCoy         |
| US-10264996-B2   | Method and apparatus for wirelessly monitoring repetitive bodily movements          | Sayfe Kiaei                                                                 | Sayfe Kiaei                                          |
| US-2019231226-A1 | Method and apparatus for wirelessly monitoring repetitive bodily movements          | Sayfe Kiaei                                                                 | Sayfe Kiaei                                          |
| US-10653337-B2   | Local object detection system                                                       | Timothy W. Markison, Sayfe Kiaei, Gary McCoy                                | Timothy W. Markison, Sayfe Kiaei, Gary McCoy         |
| US-2020266708-A1 | Electronic circuit and method of controlling three-level switching converters       | Arizona Board Of Regents On Behalf Of Arizona State University              | Parisa Mahmoudidaryan, Sayfe Kiaei, Bertan Bakaloglu |
| US-11108325-B2   | Electronic circuit and method of controlling three-level switching converters       | Arizona Board Of Regents On Behalf Of Arizona State University              | Parisa Mahmoudidaryan, Sayfe Kiaei, Bertan Bakaloglu |
| US11129547B2     | Wireless in-shoe physical activity monitoring                                       | Sigmasense LLC                                                              | Timothy W. Markison, Sayfe Kiaei, Gary McCoy         |

### **Standards Contributions**

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2. “Echo Cancellation for G.Lite Universal ADSL,” OFDM, Universal ADSL Working Group, Atlanta, GA, Jan 98.
3. “8-bit QAM Constellation effects on reach for universal ADSL,” OFDM, Universal ADAL Working Group, Atlanta, GA, Jan 98.
4. “Trellis Code Modulation coding gain for OFDM,” Universal ADSL Working Group, Atlanta, GA, Jan 98.
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9. Presentations and editorials at various XDSL and OFDM standards: ITU, ETSI, UAWG, and T1E1, 97-99.
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### **Books**

“Design, Modeling and Testing of Data Converters, P Carbone, S Kiaei,” F Xu - 2014 – Springer, © Springer-Verlag Berlin Heidelberg 2014

### **Refereed Journal Papers**

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**Conference Publications**

1. “ Switching Battery Charger with Cascaded Two Loop Control Using Time-Based Techniques,”. ChaiYong Lim; Debashis Mandal; Bertan Bakkaloglu; Sayfe Kiaei, Published in: 2021 IEEE Applied Power Electronics Conference and Exposition (APEC), June 2021
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127. "VLSI Design of Bit/Serial Adaptive IIR Filters," Proc. of IEEE Pacific Conference on Communications, Computers, and Signal Processing, Victoria, Canada, pp. 650-652, June 1989. [R. Badyal, S. Kiaei]
128. "CCA Approach for ARMA Spectral Analysis," Proc. of IEEE International Symposium on Circuits and Systems, Portland, OR, pp. 1319-1322, May 1989. [S. Kiaei, L. Luo]
129. "Canonical Correlation Analysis (CCA) for ARMA Spectral Estimation," IEEE International Symposium on Circuits and Systems, May, 1989. [Kiaei, S.; Luo, L.]
130. "VLSI Implementation of Adaptive Bit/Serial IIR Filters," IEEE Pacific Rim Conference on Communications, Computers and Signal Processing, June 1989. [Badyal, R.; Kiaei, S.]
131. "VLSI design of WAP for Recursive Equations," VLSI Signal Processing, 1988. [S. Kiaei, U. Desai]
132. "Independent Data Flow Wavefront Array Processors for Recursive Equations," Proc. of 20<sup>th</sup> Annual Conference on Information Sciences and Systems, Princeton University, NJ, 1986. [S. Kiaei, U. Desai]
133. "A Stochastic Realization Approach to Reduced-Order Hierarchical Estimation," Proc. of 24<sup>th</sup> IEEE Conference on Dec., Ft. Lauderdale, FL, pp. 416-421, December 1985. [U. Desai, S. Kiaei]
134. "Hierarchical Estimation Algorithms," Proc. of IEEE Conference on Man, Cybernetics, and Systems, Tucson, AZ, October 1985. [U. Desai S. Kiaei]
135. "Approximation of Markovian Models with Non-Constant Parameters," Proc. of 23<sup>rd</sup> IEEE Conference on Dec., Las Vegas, NV, pp. 1642-1644, December 1984. [U. Desai, S. Banerjee, S. Kiaei]
136. "A Canonical Correlation Approach to Reduced-Order LQR Design," Proc. of 23<sup>rd</sup> IEEE Conference on Dec., Las Vegas, NV, pp. 1523-1528, December 1984. [U. Desai, S. Banerjee, S. Kiaei]

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**GRADUATE STUDENT ADVISEES & RESEARCH PROJECT**

***(Partial list of Students graduated, current employment to the best of my knowledge)***

1. J. Durgam, VLSI Design of Dynamically Reconfigurable Array Processors, MSEE, 1988. Intel.
2. J. Gilbert, Minimization Techniques for PLAs, MSEE, 1988, Tektronix Inc.
3. L. Luo, CCA Methods for ARMA Spectral Estimation, MSEE, 1989. Berkeley Research Center
4. E. Zahl, Enhancement Methods for A/D Noise Reduction, MSEE, 1989. AT&T
5. L. Aihua, Synthesis of MRAs, MSEE, 1990. Intel.
6. F. Aslam, Image Restoration Methods, MSEE, 1990.
7. S.H. Chee, FSCL Circuits for Mixed-Mode IC's, MSEE, 1990. Linear Tech.
8. C. Dawson, MSEE, 1990. Boeing
9. A. Chow, Source-Coupled Logic ALU, MSEE, 1990. Intel
10. S. Maskai, Decimation Filters Using FSCL Circuits, MSEE, 1991. Intel
11. L. Louis, VLSI Implementation of Toeplitz Matrices, MSEE, 1991.
12. R. Badyal, Bit/Serial VLSI Design of IIR Filters, MSEE, 1992, HP
13. Lap Mui, Piece-Wise Linear Schedule for VLSI Arrays, MSEE, 1992. HP
14. S. Abdennadher, Adaptive Sigma-Delta Modulators, MSEE, 1992. Level One / Intel.
15. H. Bribech, Second Order Adaptive A/D Schemes, MSEE, 1992.
16. B. Hickman, MSEE, 92. Tektronix
17. M. Maleki, Current-Mode Flash A/D, MSEE, 1992. University of Oregon
18. Man Wong, Low-Noise Decimation Filter for Mixed-Mode ICs, MSEE, 1993, Motorola.
19. Anu Krishna Swamy, Low Noise IC Blocks for Mixed-mode IC's, MSEE, 1993, Ph.D., 1997.
20. Manu Srivastava, Comparison of Differential Logic (FSCL, CVSL, DSLL), MSEE, 1994, Intel.
21. Joel Oren, VLSI Design of Asynchronous FIR Filters, MSEE thesis, Feb. 1994. E-Systems.
22. Y. Zheng, VLSI Design and Synthesis of Multi-Rate Arrays, Ph.D. March 94, Hughes Research.
23. Satish Kulkarni, Low-Sensitivity Filters, MSEE, 1995, Motorola.
24. Amit Dutta, Multi-user Interference Cancellation, Ph.D, Dec. 97, Faculty, India.
25. Dwight Poplin, Multiplierless MPEG Decoder, MSEE, 1996. HP.
26. Maxim Scarpa, Adaptive I/Q Miss-match Correction for Direct Conversion Receivers, MSEE 1998.
27. Jeff McNeal, Sigma-Delta Frequency-to-Time Conversion, MSEE, 1998. Level One Comm.
28. Julia Vogel, Adaptive DC offset Cancellation, MSEE, 1998. Faculty in Germany.
29. Takao Inoue, MS, Echo Cancellation for ADSL, 1998. MSEE, The U of Texas at Austin.
30. Navid Lashkarian, Frequency off-set estimation and Synchronization of OFDM systems, Ph.D., June 1999. Broadcom Inc. & Faculty at UC San Jose.

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31. Guner Arslan, (co-advisor with B. Evans), "Fast Equalization for DMT systems, with applications to ADSL," Ph.D. The University of Texas at Austin, 2000
32. Salem Abdennadher, I/Q Mismatch Correction for RF Wireless transceivers, Ph.D., Level One Comm/Intel.
33. Can Sandalci, DSL Line Driver, Ph.D., 2001, Intel.
34. Dean Badillo, Low-Cost VCO Ring Oscillators, PhD, 2004, Intel, Chandler,
35. Siamak Abedinpour, PhD, 2005 Freescale, Tempe, Arizona
36. Hemanth Shivalingaiah, Multi-Band Low Noise Amplifiers, Ph.D., 2006, Intel,
37. Shahin Farahani, PhD, 2006, Qualcomm Inc,
38. Nazanin Darbanian, M.S. Freescale, Tempe, Arizona
39. Joe Rutkowski, Joseph, MS, 2004, Phillips.
40. Chaudhuri, Bikram, Synthesizer, MS/PhD, MS 2004.
41. Zhang, Jiandong, MEMs, MEMS, December-04
42. Afsahi, Ali, MS/PHD, UC San Diego, QUALCOMM, Connection One
43. Chen, Xiaomin, UWB, PHD, 2007, SRC/Motorola
44. Jali, Hilda, Power Management, MS, June-05,
45. Xuejin Wang, RF Optimization, 2006 CAD tools, PhD, Neo-Linear
46. Umar Lyles, Power Amplifier, MS, 2006. Texas Instruments
47. MS, Erika Munoz, RADHARD, 2007, Intel
48. Waleed Khali, (Co-Advisor), Professor at Ohio State
49. Jennifer Kitchen, PhD, 2009, Professor at ASU
50. Shahin Mehdizad Taleie, RFDAC, PhD, 2009, Qualcomm
51. Ilker Deligoz, PHD, 2009, Qualcomm
52. Hyung Kim, PhD, Jan 2010, Intel
53. Jung Le, PhD 2010, Intel, TI
54. Syed Naqvi, PhD, 2012, Intel.
55. Todd Martin, MS, 2011, TI
56. Seungkee Min, PhD, 2011, Intel
57. Ali Meamar, Post Doc, RFIC 2013
58. Hitesh Khunti, MS 2013, Qualcom
59. Debashis Mandal, Post Doc, Research faculty 2015-2018
60. Edgar Martinez, PhD, 2015, Qualcomm
61. Chirag Desai, MS, 2016, Qualcom
62. Sanjay Avasarala, MS, 2016

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63. Li Ming, MS, 2017
64. Qirong Peng, MS, 2017,
65. Yu Geng, PhD, 2018
66. Amir Ayati, PhD Aug 2018; Qualcomm
67. Pasisa Mahmoudi, PhD, May 2019, Qualcomm
68. Chai Yong, MS: 2015, PHD: 2019, Qualcomm
69. Shrikant Singh, MS: 2016, PhD, 2019, Movandi
70. Amir Alizadeh, Research Faculty 2019-Present
71. Ata S. PhD, 2021, Ata Sarrafinejad, PhD, 2021

**UNIVERSITY COMMITTEES**

Various Committees at ASU, Oregon State University, etc.

**INDUSTRY COMMITTEES**

- Arizona Telecommunications and Information Council (ATIC), Board Member
- CAS Fellows Committee (ends December 31, 2006)
- *IEEE CAS Phoenix Chapter Organizers (the committee is in the process of determining new chair – current chair not active)*
- *Executive Committee, RFIC 2006.*
- *Technical Program Comm, IEEE RFIC 2006.*
- *Executive Committee, Conferences, International Solid State System's Conference.*
- *IEEE CAS Society, VLSI Technical Comm. Member*
- *Editorial Board, IEEE Communications Surveys & Tutorials*
- *Radio Frequency Integrated Circuits- RFIC 2006*
- *IEEE RF Integrated Circuits Conference, Committee Chair for two workshops*
- *International Microwave Symposium, IMS-MTT 2006*
- *Int. Symposium on Circuits and Systems - ISCAS 2006*
- *Wireless Networks & Emerging Technologies, WNET06*
- *Midwest Symposium on Circuits and System*
- *Arizona Governor IT Advisory Committee – GITA*
- *Arizona Telecom – ATIC*

**INSTRUCTIONAL SUMMARY**

- Digital IC Design, Analog IC Design, Advance CMOS Analog IC, VLSI, RFIC Design
- Wireless Transceiver Design, Wireless Communications, GPS, Telecomm Systems, Digital Communication

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- Signal Processing, Advance digital signal processing, Communication, Digital Communication, Digital Audio Processing, Adaptive array processing
- Computer Architecture, Microprocessor System Architecture, Pipeline Array Processing