

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.

UNILOC 2017 LLC,  
Patent Owner

U.S. Patent No. 7,969,925

Filing Date: July 8, 2010

Issue Date: June 28, 2011

Title: Peer-to-Peer Mobile Data Transfer Method and Device

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*Inter Partes* Review No.: IPR2019-00702

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**DECLARATION OF DR. HENRY H. HOUH  
UNDER 35 U.S.C. § 1.68**

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## EXHIBIT LIST

| Exhibit No. | Description   |
|-------------|---|
| 1001        | U.S. Patent No. 7,969,925 to Lin (“ <b>925 patent</b> ”)  |
| 1002        | Declaration of Dr. Henry Houh (this declaration)  |
| 1003        | File History of U.S. Pat. No. 7,969,925 to Lin  |
| 1004        | File History of U.S. Pat. No. 7,961,663 to Lin  |
| 1005        | Certified Translation and Original of European Pat. App. Pub. EP 1 009 153 A1 (“ <b>Alos</b> ”)   |
| 1006        | U.S. Pat. No. 6,847,632 (“ <b>Lee</b> ”)  |
| 1007        | European Pat. App. Pub. EP 1 385 323 A1 (“ <b>Cordenier</b> ”)  |
| 1008        | Complaint for Patent Infringement (“ <b>Uniloc Complaint</b> ”)   |
| 1009        | <i>Declaration of Sandy Ginoza for IETF RFC 1122: Requirements for Internet Hosts - Communication Layers</i> with the exhibit RFC 1122, “Requirements for Internet Hosts - Communication Layers” (“ <b>RFC1122</b> ”)   |
| 1010        | <i>Declaration of Sandy Ginoza for IETF RFC 793: Transmission Control Protocol</i> with the exhibit, RFC 793, “Transmission Control Protocol” (“ <b>RFC793</b> ”)   |
| 1011        | U.S. Pat. App. Pub. No. 2003/0217174 (“ <b>Dorenbosch</b> ”)  |
| 1012        | U.S. Patent No. 5,163,131 (“ <b>Row</b> ”)  |
| 1013        | W. Richard Stevens, “Unix Network Programming,” Chapters 1, “Introduction”; 4, “A Network Primer”; 5, “Communication Protocols”; and, 6, “Berkeley Sockets”   |
| 1014        | Information Disclose Statement Under 37 C.F.R. §§ 1.97 and 1.98 that includes “Universal Mobile Telecommunications System (UMTS); Technical realization of the Short Message Service (SMS) (3G TS 23.040 version 3.5.0 Release 1999)” and was submitted August 15, 2002, concurrently with U.S. Pat. App. 10/218,580, which application was published on February 27, 2003, as U.S. Pat. App. Pub. 2003/0040300 A1 (“ <b>SMS Specification</b> ”) |

| Exhibit No. | Description  |
|-------------|--|
| 1015        | W. Richard Stevens, TCP/IP ILLUSTRATED, VOLUME 2: THE PROTOCOLS (1994)   |
| 1016        | U.S. Pat. No. 8,018,877 to Lin   |
| 1017        | U.S. Pat. Pub. No. 2005/0278448 to Mazor (“ <b>Mazor</b> ”)  |
| 1018        | Declaration of Harold Ogle Regarding JSR-000120, “Wireless Messaging API (WMA) for Java™ 2 Micro Edition Version 1.0” with the exhibit JSR 120, “Wireless Messaging API (WMA) for Java™ 2 Micro Edition Version 1.0” (“ <b>WMA</b> ”)                |
| 1019        | IBM Dictionary of Computing, 10th Ed. (1993)   |
| 1020        | Newton’s Telecom Dictionary, 11th Ed. (1996)   |
| 1021        | <i>Declaration of Sandy Ginoza for IETF RFC 2543: SIP: Session Initiation Protocol</i> with the exhibit RFC 2543, “SIP: Session Initiation Protocol” (“ <b>RFC2543</b> ”)  |
| 1022        | <i>Declaration of Sandy Ginoza for IETF RFC 791: Internet Protocol</i> with the exhibit RFC 791, “Internet Protocol”   |
| 1023        | U.S. Pat. Pub. No. 2003/0040300  |
| 1024        | <i>Declaration of Sandy Ginoza for IETF RFC 2026: The Internet Standards Process – Revision 3</i> with the exhibit, RFC 2026: “The Internet Standards Process – Revision 3” (“ <b>Internet Standards Process</b> ”)                                  |
| 1025        | U.S. Pat. No. 7,181,231  |
| 1026        | <i>Declaration of Mr. Craig Bishop regarding ETSI TS 123 040 V3.5.0, “Universal Mobile Telecommunications System (UMTS); Technical Realization of the Short Message Service (SMS) (3GPP TS 23.040 version 3.50 Release 1999) with appendices A-D</i> |
| 1027        | <i>Declaration of Sandy Ginoza for IETF RFC 768: User Datagram Protocol</i> with the exhibit, RFC768: User Datagram Protocol   |

I, Dr. Henry H. Houh, do hereby declare:

## **I. INTRODUCTION**

1. I have been retained as an expert witness on behalf of petitioner Apple Inc. (“Apple”) for the above-captioned Petition for Inter Partes Review (“IPR”) of U.S. Patent No. 7,969,925 (“925 patent”). I am being compensated for my time in connection with this IPR at my standard consulting rate of \$620 per hour. My compensation is in no way dependent on the outcome of this matter.

2. I have been asked to provide my opinions regarding whether claims 1-20 (“the challenged claims”) of the 925 patent are invalid as anticipated or obvious. In preparing this declaration, I have reviewed the 925 patent, the file history of the 925 patent, and numerous prior art references from the time of the alleged invention.

3. I have been advised and it is my understanding that patent claims in an IPR are interpreted using the same claim construction standard that is used to construe the claim in a civil action in federal district court.

4. In forming the opinions expressed in this declaration, I relied upon my education and experience in the relevant field of the art, and have considered the viewpoint of a person having ordinary skill in the relevant art, as of 2004.

## II. BACKGROUND AND QUALIFICATIONS

5. My background and expertise that qualify me as an expert in the technical issues in this case are as follows.

6. As indicated on my *Curriculum Vitae* attached as **Exhibit A**, I received a Ph.D. in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology (“MIT”) in 1998. I also received a Master of Science degree in Electrical Engineering and Computer Science in 1991, a Bachelor of Science Degree in Electrical Engineering and Computer Science in 1989, and a Bachelor of Science Degree in Physics in 1990, all from MIT.

7. During my college studies, I focused on communications and data networking. I took specialized courses including graduate courses in telecommunications networks, optical communications, and data networking. I, along with other graduate students in a networking research group, maintained both the computer workstations and the networking devices in the research group.

8. I have worked in data networking and distributed multimedia systems on several occasions. As part of my doctoral research at MIT from 1991-1998, I worked as a research assistant in the Telemedia Network Systems (“TNS”) group at the Laboratory for Computer Science. The TNS group built a high-speed gigabit ATM network and applications which ran over the network, such as remote video capture (including audio), processing and display on computer terminals. In

addition to helping design the core network components (such as the ATM switch), designing and building the high-speed ATM links, and designing and writing the device drivers for the interface cards, I also set up the group's web server, which at the time was one of the first several hundred web servers in existence. Our high-speed data network carried multimedia data including video and audio data within ATM cells.

9. Like all ATM networks, interconnection of various endpoints in our ATM system required the setup of end-to-end virtual circuits which required, for each ATM switch in the connection path, the switch's header remapping tables to be configured for each virtual circuit required. I developed and implemented our system's protocol of controlling the content of these tables and the overall circuit setup.

10. The TNS group was the first group to initiate a remote video display over the World Wide Web. Vice President Al Gore visited our group in 1996 and received a demonstration of—and remotely drove—a radio-controlled toy car with a wireless video camera mounted on it; the video was encoded by TNS-designed hardware, streamed over the TNS-designed network and displayed using TNS-designed software.

11. I authored or co-authored twelve papers and conference presentations on our group's research. I also co-edited the final report of the gigabit networking



research effort with Professor David Tennenhouse and Senior Research Scientist David Clark. David Clark is generally considered to be one of the fathers of the Internet Protocol and served as Chief Protocol Architect for the Internet. With its focus on networking, the group, including myself, set up and maintained the network and computer systems. These systems included the networking on the workstations and desktops, the distributed file system, desktops and workstations, setting up and maintaining the distributed file system (Network File System) and the authentication system (Network Information Service, formerly known as Yellow Pages). Our system allowed users to log into any of the group's workstations using their username/password, which allowed that all of the user's files would be virtually mounted on that workstation as a networked home directory.

12. I defended and submitted my Ph.D. thesis, titled "Designing Networks for Tomorrow's Traffic," in January 1998. As part of my thesis research, I analyzed local-area and wide-area flows to show a more efficient method for routing packets in a network, based on traffic patterns at the time. My thesis also addressed real-time streamed audio and video. The network traffic that I analyzed was IP protocol traffic, including UDP and TCP.

13. I have been involved in Voice over Internet Protocol (“VoIP”) technologies since 1997 and have specific experience in designing and testing VoIP networks.

14. From 1997 to 1999, I worked at NBX Corporation, which was acquired by 3Com Corporation in 1999. During this time, I was a Senior Scientist and Engineer working in IP Telephony. NBX delivered the world’s first fully featured business telephone system to run over a data network, the NBX100. NBX was one of the first business phone systems to be configurable via a web interface. Users and administrators had access to varying levels of configuration for the phone system.

15. As part of my work at NBX, I designed the core audio reconstruction algorithms for the telephones which de-packetized the voice data and reconstructed the audio. In addition, I designed the voice data packet transmission algorithms. I created a system to capture and analyze network packets sent by devices in the NBX system for aid in testing and debugging. I also designed and validated the core packet transport protocol used by the phone system. In addition, I designed and oversaw the development of the underlying transport protocol used by the NBX100 phone system for reliable packet transport. That transport protocol is still used by the NBX100 system and its successors and is estimated to be used hundreds of millions of times daily. I wrote NBX’s first demonstration IP software

stack, which added the capability for utilizing the NBX100 phone system on an IP network. NBX first demonstrated a phone in the NBX100 system working over the Internet in 1998 at a trade show in Las Vegas. I was later the lead architect in designing NBX's next-generation highly scalable system, and, after NBX was acquired by 3Com, I did some work with 3Com's cable equipment division, including demonstrating a working NBX IP phone system over 3Com's cable equipment infrastructure using an early version of DOCSIS at a trade show in 1999. The NBX100 was the market's leading business phone system to run on a data network for several years following its introduction. During that time, I became more familiar with the various standards relevant to Internet telephony as well as the problems which designers of commercial telephony operations were faced with in implementing VoIP.

16. I, along with two of NBX's founders, was awarded U.S. Patent No. 6,697,963 titled "Telecommunication method for ensuring on-time delivery of packets containing time-sensitive data," for some of the work we did while at NBX.

17. After NBX, I worked at Teradyne, a test tool company primarily focused on semiconductors. Teradyne had recently acquired Hammer, a company that specialized in load and functional testing for telecommunications systems. The Hammer product is well known as a telecom test tool. Teradyne spun out

Hammer and several other internal divisions into an independent company called Empirix. I became Chief Technologist of the Hammer division of Empirix.

Empirix was a leader in VoIP network testing and monitoring.

18. At Empirix, I laid out a new multi-year product vision for data network testing, secured internal funding for the effort, and led a team to deliver a new technology platform to the market in February 2001. This new product, PacketSphere, initially emulated network behavior so that wide-area VoIP connections could be tested in a lab. A later release allowed PacketSphere to generate high volumes of VoIP calls, including media streams, and to monitor the quality of VoIP voice streams. Later, the core technology was added to other Empirix products such as Empirix's Hammer XMS to monitor thousands of VoIP media streams in real time to determine their quality. PacketSphere was Empirix's most successful new platform introduction. Companies purchased the PacketSphere product to emulate an Internet Protocol network to see the effects of deploying their product on the Internet prior to launch. PacketSphere received several industry awards.

19. During my time at Empirix, I presented lectures on VoIP and data network testing to companies including Lucent Labs (formerly AT&T Bell Labs). I was also invited to present several guest lectures in a software engineering course at MIT. Since then, I have also participated twice as a unit lecturer (two weeks) in

an experimental course that was taught by an Institute Professor (the highest award that a MIT Professor can achieve) and sponsored by the Chairman of the MIT Corporation (MIT's board of trustees).

20. From 2004 to 2008, I was employed by BBN Technologies Corp., a technology research and development company located in Cambridge, Massachusetts. BBN Technologies is a world-renowned company with expertise in acoustics, speech recognition, and communications technology. BBN Technologies staff have pioneered many internetworking technologies and Internet applications, and built some of the world's largest government and commercial data networks.

21. My duties and responsibilities at BBN Technologies generally included commercialization of the technologies developed by BBN Technologies, which included spinning off companies and growing commercial businesses in-house. More particularly, I was involved in utilizing the award-winning AVOKE STX speech recognition technology to create the public audio/video search engine EveryZing (formerly known as PodZinger) which was spun out into a stand-alone company now known as RAMP, Inc. PodZinger won the 2006 MITX Technology Award for best Web 2.0 Application and was also named the 2006 Forbes Favorite Video & Audio Search Engine, beating out Google, Yahoo, and other companies. After managing the creation of the initial prototype system, PodZinger built out a

full streaming audio and video search solution when I was the Vice President of Operations and Technology there. I was also involved in the Boomerang Mobile Shooter Detection project as the Vice President of Engineering for the program. The Boomerang system was deployed to Iraq and Afghanistan, and was credited with saving many lives.

22. From 1989 to 1990, I worked at AT&T Bell Laboratories on optical computers. This work generated six peer-reviewed papers, and multiple U.S. and European patent applications in which I was named as a co-author or inventor. I also interned at AT&T Bell Laboratories in 1987 and 1988. Additional relevant experience in the field of optical computers is listed in my Curriculum Vitae.

23. I am a named inventor on several patents and published patent applications that are related to the VoIP technology including: U.S. Patent No. 6,967,963, entitled “Telecommunication Method for Ensuring On-time Delivery of Packets Containing Time- Sensitive Data”; U.S. Patent Application Publication No. 20020015387, entitled “Voice Traffic Packet Capture and Analysis Tool for a Data Network”; U.S. Patent Application Publication No. 20020016708, entitled “Method and Apparatus for Utilizing a Network Processor as Part of a Test System”; U.S. Patent Application Publication No. 20020016937, entitled “Method and Apparatus for Utilizing a Network Processor as Part of a Test System”; and

U.S. Patent No. 7,590,542, entitled “Method of Generating Test Scripts Using a Voice-Capable Markup Language.”

### **III. MATERIALS CONSIDERED FOR THIS DECLARATION**

24. In addition to my general knowledge, education, and experience, and the prior art publications I listed above, I considered the materials listed in the **Exhibit List** above in forming my opinions.

### **IV. UNDERSTANDING OF THE LAW**

25. In expressing my opinions and considering the subject matter of the claims of the 925 patent, I am relying upon certain basic legal principles that Apple counsel has explained to me.

26. I understand from Apple counsel that a patent claim is invalid as anticipated under 35 U.S.C. § 102 if each element of that claim is present either expressly or inherently in a single prior art reference. I understand from Apple counsel, to be an inherent disclosure, the prior art reference must necessarily disclose the limitation, and the fact that the reference might possibly practice or contain a claimed limitation is insufficient to establish that the reference inherently teaches the limitation.

27. I understand from Apple counsel that a claimed invention is unpatentable under 35 U.S.C. § 103, if the differences between the invention and the prior art are such that the subject matter as a whole would have been obvious at

the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. I understand from Apple counsel that the obviousness analysis takes into account factual inquiries including the level of ordinary skill in the art, the scope and content of the prior art, and the differences between the prior art and the claimed subject matter.

28. I understand from Apple counsel that the Supreme Court has recognized several rationales for combining references or modifying a reference to show obviousness of claimed subject matter. These rationales include the following: (a) combining prior art elements according to known methods to yield predictable results; (b) simple substitution of one known element for another to obtain predictable results; (c) use of a known technique to improve a similar device (method, or product) in the same way; (d) applying a known technique to a known device (method, or product) ready for improvement to yield predictable results; (e) choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; and, (f) some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

29. Finally, I understand from Apple counsel that secondary factors may be considered in an obviousness inquiry. I understand from Apple counsel that



these are also referred to as secondary considerations and may include evidence of long-felt need, failure of others, skepticism of those of skill in the art, licensing, commercial success, recognition in the industry, acquiescence, evidence of copying, and unexpected results.

30. Moreover, I understand from Apple counsel that for objective evidence of nonobviousness to be accorded substantial weight, the proponent of such evidence must establish a “nexus” between the evidence and the merits of the patent at issue. Specifically, I understand from Apple counsel that the secondary consideration must be tied to the merits of the claimed invention of the patent at issue. I understand from Apple counsel that where the alleged secondary consideration results from something other than what is both claimed and novel, there is no nexus to the merits of the claimed invention and the secondary considerations are thus not indicative of nonobviousness. I understand from Apple counsel that it is the patentee’s burden to come forward with evidence that a nexus exists.

## **V. SUMMARY OF OPINIONS**

31. Based on my review of the 925 patent and its prosecution history, the other materials I have considered, and my knowledge and experience, my opinions are as follows:

- Claims 1, 3-8, 10-15, 17-20 are obvious over the combination of Alos and RFC793;
- Claims 2, 9 and 16 are obvious over the combination of Alos, RFC793, SMS Specification and WMA;
- Claims 1, 3-8, 10-15, 17-20 are obvious over the combination of Cordenier and RFC 793;
- Claims 2, 9 and 16 are obvious over the combination of Cordenier, RFC793 and Dorenbosch;
- Claims 1, 3-8, 10-15, 17-20 are obvious over the combination of Lee, RFC793 and SMS Specification; and,
- Ground 6: Claims 2, 9 and 16 are obvious over the combination of Lee, RFC793, SMS Specification and WMA.

## **VI. OVERVIEW OF THE 925 PATENT**

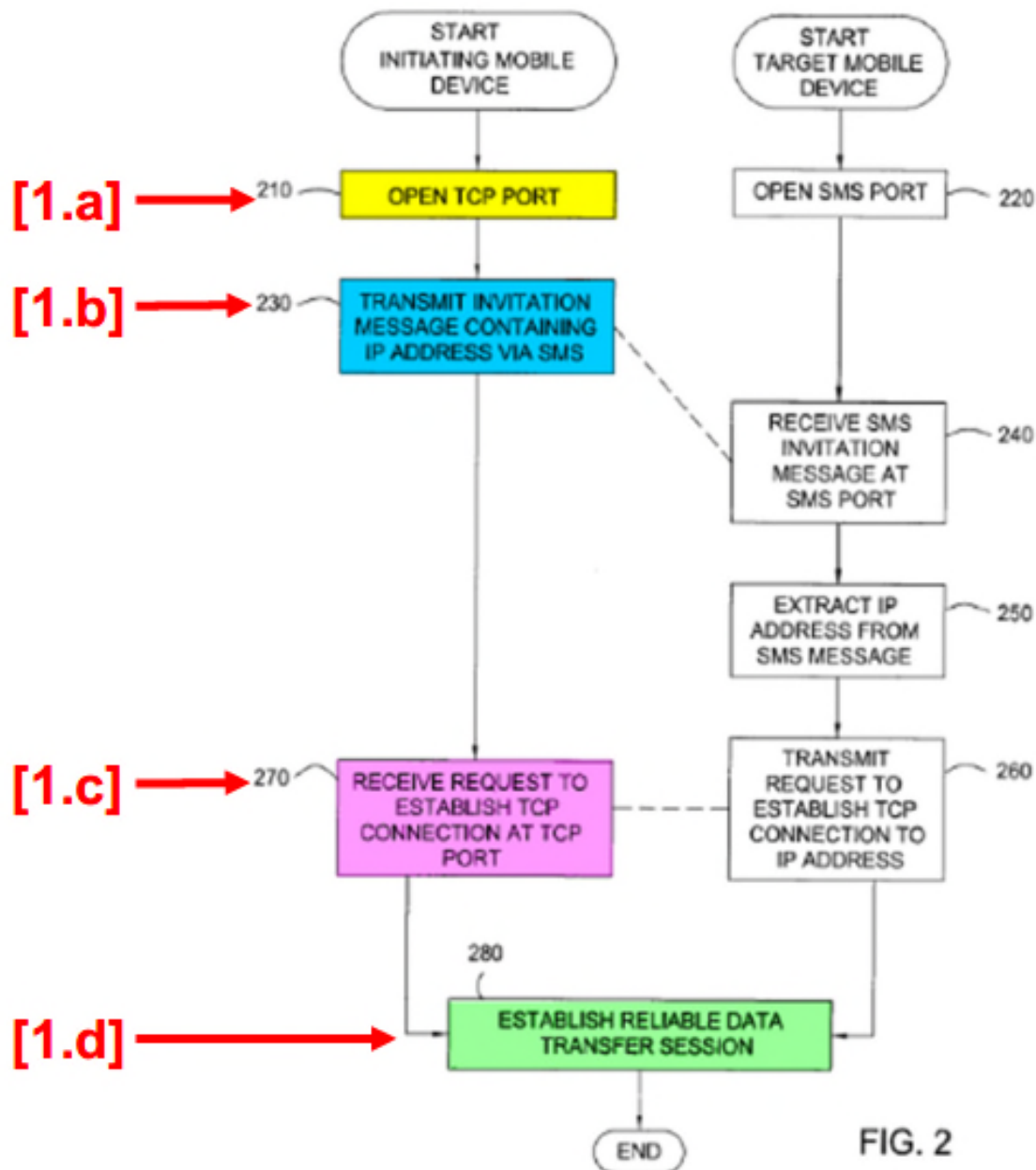
### **A. Summary of the 925 Patent**

32. The 925 patent describes a technique for transferring data between mobile devices that does not require a server. Ex. 1001 at 1:61-67. With this technique, a first mobile device sends an SMS invitation message that includes its IP address to a second mobile device, and the second mobile device responds by initiating a TCP/IP connection to the first mobile device's IP address. Fig. 2, Ex. 1001 at 4:23-35.

**B. Claims of the 925 Patent**

33. Claim 1 tracks the disclosed technique by claiming (1.pre) a method of establishing a data connection comprising (1.a) opening a listening software port, (1.b) transmitting an invitation via page-mode messaging (e.g., SMS), (1.c) receiving a response at the software port, and (1.d) establishing a peer-to-peer data

transfer session. These steps are highlighted in annotated Figure 2 below.



34. Challenged claim 2 recites that the initiating mobile device receives similar invitations from “another” mobile device through the page-mode messaging service and transmits a response thereto. Challenged claim 3 specifies

the type of address (IP), claims 4-5 specify the type of page-mode messaging service (SMS and PIN-to-PIN, respectively), claim 6 specifies the type of unique ID used by the service (telephone number), and claim 7 specifies the type of data session (TCP). Each of the groups of challenged claims 8-14 and claims 15-20 parallel claims 1-7.

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

35. A person of ordinary skill in the art at the time of the alleged invention of the 925 patent (a “POSITA”) would have had a Bachelor’s degree in computer science or a comparable field of study, plus approximately two to three years of professional experience with cellular phone and IP networks, or other relevant industry experience. Additional graduate education could substitute for professional experience and significant experience in the field could substitute for formal education. The knowledge of a POSITA would have included the following subject matter.

#### **1. Networking and the Internet**

36. A lowercase-I “internet” or “internetwork” is a network of networks that all use the same protocol suite to communicate. Ex. 1015 at 7; *see also* Ex. 1013 at 13, 12-14. “The goal of internetworking is to hide the details of what might be different physical networks, so that the internet functions as a coordinated unit.” Ex. 1013 at 13; Ex. 1015 at 8.

37. The uppercase-I “Internet” is an internet or internetwork that uses the TCP/IP protocol suite. Ex. 1009 at 10-12; *see also* Ex. 1013 at 40; Ex. 1015 at 4. The TCP/IP protocol suite includes the “Transmission Control Protocol” (TCP), “User Datagram Protocol” (UDP), and “Internet Protocol” (IP). Ex. 1009 at 12-14, 31-42 (introducing the network layer protocols and describing the IP), 81 (describing UDP), 86 (describing TCP).

## 2. TCP/IP Ports

38. The 925 patent discusses the use of TCP ports. *See, e.g.*, Fig. 2 (step 210 “Open TCP Port”). During prosecution of the first application to which the 925 patent claims priority, applicant admitted that opening a TCP Port was well-known in the prior art. *See, e.g.*, Ex. 1004 at 415 (“It is well-known in the art that any general computer system may open different types of default or well-known listening software ports for specific purposes.”), *id* (“well-known TCP ports ... are opened as a default to service any and all devices for specific purposes (e.g., FTP, telnet, HTTP, etc.) ... .”), 416 (“mobile devices may generally have the **capability** (and indeed **must** have such a capability for Applicant’s claimed invention) to open a listening software port ... .”) (emphasis original), 416 (footnote 4, discussing “well-known TCP ports” for FTP and other services), 422 (Annex D disclosing well-known TCP/UDP ports). These admissions are consistent with the

level of disclosure in the 925 patent, which simply states that ports may be opened and used without any further explanation.

39. Applicant's admissions as to the prior art are correct. A POSITA would have known that the Transport Layer of the Internet Protocol suite, most notably the Transmission Control Protocol ("TCP") and the User Datagram Protocol ("UDP") used ports. Ex. 1009 at 12-13 (explaining the two most prominent transport layers TCP and UDP); Ex. 1004 at 416, 422 (Annex D reciting same and listing the admittedly well-known ports for both TCP and UDP). Because certain dependent claims recite that the transport layer is TCP, I will focus on the use of TCP ports.

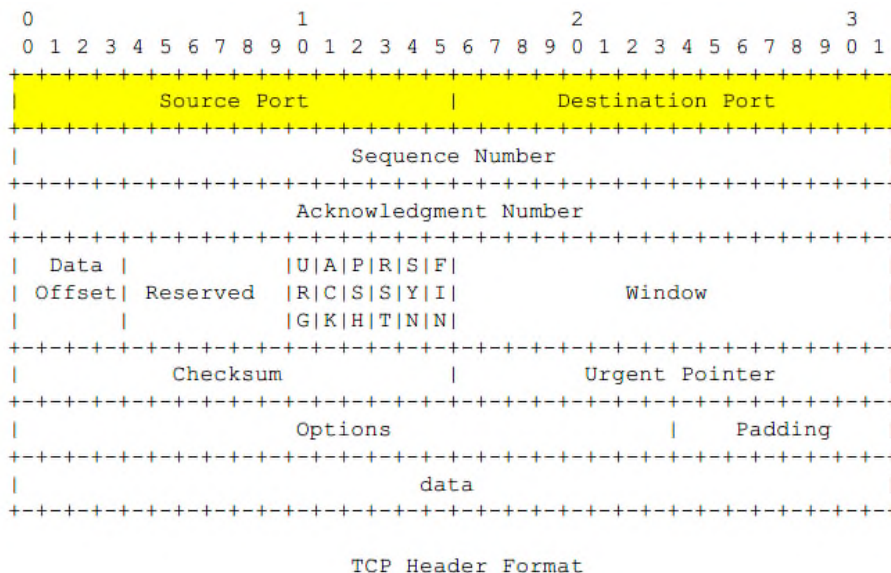
40. Ports were extensively described in the Transmission Control Protocol (TCP) specification, RFC793, published in 1981. Ex. 1010 at 16, 19-21, 24-28, 30 ("LISTEN - represents waiting for a connection request from any remote TCP and port."), 54-55, 90 ("port: The portion of a socket that specifies which logical input or output channel of a process is associated with the data"). TCP itself was also notoriously well-known in the art at the time of the 925 patent as a large portion of Internet messages, both then and now, are conducted using TCP/IP. RFC793 explains that TCP is "intended to provide a reliable process-to-process communication service in a multinet environment." Ex. 1010 at 11, 10, 12, 14, 16-17, 18-19, 93. TCP interfaces on one side to a user or application process,

and on the other side to a lower level protocol, typically Internet Protocol, which does not itself provide reliable communication service. Ex. 1010 at 12; Ex. 1022 at 10-12.

41. To allow for many processes within a single host to utilize the TCP software communications facilities, TCP provides a set of addresses, referred to as port identifiers or simply ports, within each host. Ex. 1010 at 14 and 19. Thus, a port is the address for a particular process at the host level in the same way that the IP address is the address for a particular host at the network level. Ex. 1015 at 14 (referring to demultiplexing to identify particular process/application at host based on TCP port number). The ports are independently defined by a particular host, but are not necessarily unique as between hosts. Ex. 1010 at 19. To define a unique address, the TCP port is concatenated with the IP address to form what is known as a “socket address” or simply “socket,” which uniquely identifies a particular process on a particular host (a communication end point) across the network. *Id.* Two active interconnected sockets thus uniquely and fully define a connection over the network. *Id.* TCP messages include headers that specify both the source and destination ports in the same way that IP headers define both source and destination IP addresses. Ex. 1010 at 24. The combination of an IP address and port is also commonly referred to in the art as a “transport address.” Ex. 1013 at 35.



42. The standard TCP header includes both source and destination ports as shown in Figure 3 of RFC793:



Note that one tick mark represents one bit position.

Figure 3.

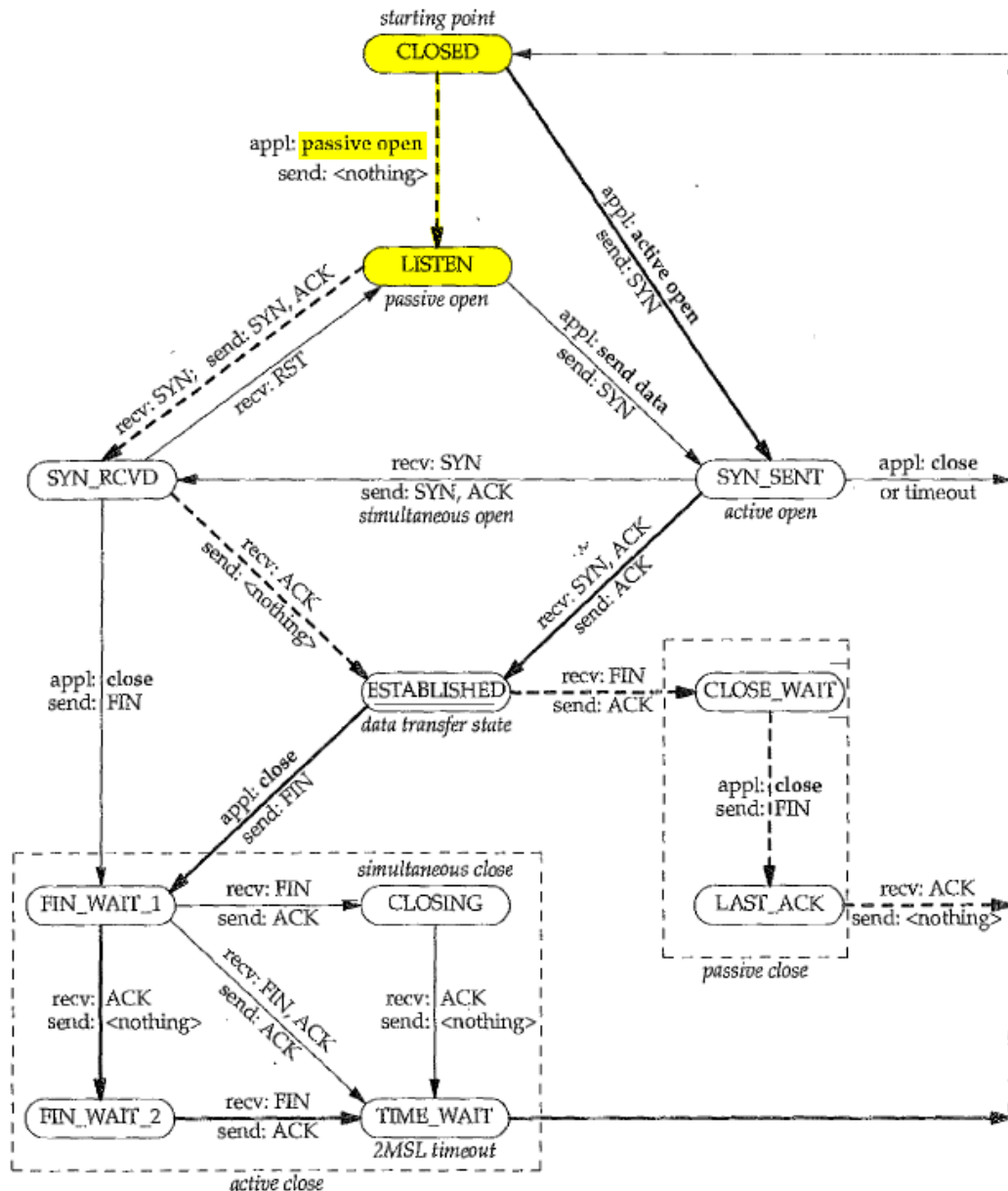
Ex. 1010 at 24 (highlighting added); see also Ex. 1015 at 69.

43. The TCP software running on a particular host assigns port numbers to processes running on that host, although industry organizations have reserved certain port numbers for certain commonly used processes. Ex. 1010 at 20; Ex. 1015 at 15-16. For example, port 21 is associated with FTP (file transfer protocol) for file transfer programs, port 25 is associated with SMTP (simple mail transfer protocol) for email programs, and port 80 is associated with HTTP (hypertext transfer protocol) for web browsers. Since 2002, these well-known ports, as well as registered ports and private ports, have been maintained by IANA (Internet

Assigned Numbers Authority) in an on-line database. Ex. 1015 at 16. While well-known port assignments were permanent, other ports, referred to in the art as ephemeral ports, are temporary ports that are assigned on an as-needed basis. Ex. 1015 at 16.

44. A process on a host utilizes TCP by making calls to OPEN or CLOSE a connection, SEND or RECEIVE data, or to obtain STATUS about a connection. These calls are like other calls from user programs on the operating system, such as calls to open, close, read to, or write from files. Ex. 1010 at 18. To open a TCP connection, an application performs an OPEN call that specifies local port and foreign socket arguments. *Id.* at 19. The local port argument specifies the local port on which incoming communications are received, and the foreign socket identifies the IP address and port of the foreign TCP endpoint. The OPEN call can be active or passive. *Id.*; *see also* Ex. 1015 at 84. A passive OPEN call “means that the process wants to accept incoming connection requests rather than attempting to initiate a connection.” Ex. 1010 at 20, 19-21, 32, 45-46, 79. If the process wishes to accept a connection from any other process, the passive OPEN call specifies a foreign socket with all zeroes. *Id.* at 20. This allows for a connection to be established with any process on any host that requests a connection to the local socket (the local port on the host and the IP address of the host). *Id.* Alternatively, the OPEN call can specify a particular foreign socket.

RFC793 explains that a passive OPEN call “is a call to LISTEN for an incoming connection.” *Id.* at 54 (emphasis added). This is illustrated diagrammatically in the TCP state transition diagram in Ex. 1015 at 85, which shows a transition from CLOSED to LISTEN when an application performs a passive open of a TCP port.



Ex. 1015 at 85 (highlighting added). In other words, the result of a passive OPEN call is that the TCP software on the host is set to the LISTEN state in which it listens for an incoming message on the specified local port.

45. A POSITA would also understand that a port must be OPEN in order for messages specifying that port to be received. RFC793 discloses that when a “connection does not exist (CLOSED) then a reset is sent in response to any incoming segment except another reset. In particular, SYNs addressed to a non-existent connection are rejected by this means. If the incoming segment has an ACK field, the reset takes its sequence number from the ACK field of the segment, otherwise the reset has sequence number zero and the ACK field is set to the sum of the sequence number and segment length of the incoming segment. The connection remains in the CLOSED state.” Ex. 1010 at 45. Thus, a POSITA would understand that a passively opened listening port would be required to receive any messages, otherwise any incoming message would be rejected.

### **3. SMS Ports**

46. The 925 patent also discusses the use of SMS ports. Ex. 1001 at Fig. 2 (step 220 “Open SMS Port”), 4:40-43 and 6:2-4. Applicant similarly admitted that SMS ports were well-known in the prior art. Ex. 1004 at 415-16 (“For example, a mobile device may support a default SMS listening software port opened to receive SMS messages from all other devices ...”). This is consistent

with the specification that merely mentions the optional use of SMS ports without further explanation.

47. Applicant's admissions are well founded, as the use of ports in connection with SMS messages was also well-known and standardized in the prior art SMS Specification itself. As disclosed in SMS Specification, 8- and 16-bit application port addressing "allows short messages to be routed to one of multiple applications in the TE (terminal equipment), using a method similar to TCP/UDP ports in a TCP/IP network." Ex. 1014 at 72-73, 66-69. The 16-bit port addresses 0-15999 are well-known ports allocated by the IANA just like the ports for TCP and UDP. *Id.* at 73. A POSITA would also have known that SMS ports could be opened in a listen mode. For example, WMA discusses an application program interface that supports the use of ports that an application on a device such as a mobile phone could use to send and receive wireless messages on services such as GSM SMS or CDMA SMS. Ex. 1018 at 21; Ex. 1018 at 44. WMA further discloses opening a port in listening mode in order to receive an SMS message and notify an application associated with that port. Ex. 1018 at 11-12, 22 (disclosing the MessageListener interface), 27-28, 31-34, 37-45.

#### **4. SMS Invitations and TCP/IP-based Responses**

48. A POSITA would have been familiar with the well-known technique of sending SMS invitations and providing IP-based responses. The 925 patent

acknowledges this in its discussion of the MMS protocol, which was one well known and standardized example of that technique. Ex. 1001 at 1:23-57. In the MMS protocol, a server sends its URL to the target mobile device using a “WAP Push over the Short Message Service (‘SMS’) protocol.” *Id.* The mobile device responds by using the server’s URL to initiate a TCP/IP connection to obtain the multimedia content. *Id.* A POSITA would know that the mobile device opens the WAP port to listen for the WAP Push over SMS, so that the message can be routed to the WAP browser, which can then use the URL to initiate the TCP/IP connection. A POSITA also understands that the server opens and listens on a TCP port for the expected TCP/IP response. An example of a WAP Push over SMS followed by a TCP/IP response is U.S. Pat. App. No. 2003/0217174 (Dorenbosch). Ex. 1011 at Fig. 3, [0027]-[0037].

**D. Claim Construction Under 37 C.F.R. § 42.104(b)(3)**

**1. “page-mode messaging service” (claims 1-2, 4-5, 8-9, 11-12, 15-16, 18)**

49. The claims and specification require that “page-mode messaging service” encompasses the Short Message Service (“SMS”). Ex. 1001 at 3:13-17 and claims 4, 11, 18. The prior art asserted herein discloses SMS.

**2. No Order Required Between the Steps of Claims 1 and 2; 8 and 9; and 15 and 16.**

50. A POSITA would understand that there is no claimed relationship between the timing of any of the steps in these independent claims vis-à-vis the steps in these dependent claims, such that the steps of the dependent claims can be performed at any time before or after the steps of the independent claims.

Similarly, a POSITA would understand that the specification does not require any temporal relationship. Thus, a POSITA would understand that none is required.

**3. “opening a listening software port” (claims 1, 8, and 15) / “opening a second listening software port” (claims 2, 9, and 16)**

51. A POSITA would understand each of these limitations means “associating a port identifier with a process,” which is the ordinary meaning of these phrases to that POSITA. As is well known in the art and as established above in Sections VI.C.2&3, opening a listening port means associating a port identifier with a process, as that is what enables the device to receive messages at that port and route them to the correct process. Ex. 1015 at 13 (“Both TCP and UDP use 16-bit port numbers to identify applications.”); Ex. 1013 at 22 (describing how “both UDP and TCP have a 16-bit port number that identifies the user process” for demultiplexing incoming data), 32 (*e.g.*, “[e]ach process on a host must have a unique identifier on that host” and “both TCP and UDP use 16-bit port numbers to identify specific user processes.”). *See also*, Ex. 1020 at 3 (defining

“port”). The TCP specification defines “port” to mean “[t]he portion of a socket that specifies which logical input or output channel of a process is associated with the data.” Ex. 1010 at 90, 20 (*e.g.*, “[w]ell-known sockets are a convenient mechanism for a priori associating a socket address [*e.g.*, port identifier] with a standard service [*e.g.*, process].”). The SMS Specification makes clear that opening an SMS port is analogous to opening a TCP/IP port. Ex. 1014 at 72-73, 66-69, 72-73 (explaining that SMS ports operate “using a method similar to TCP/UDP ports in a TCP/IP network.”).

#### **4. “PIN-to-PIN messaging service” (claims 5, 12)**

52. A POSITA would understand that this limitation means “a service that transmits information through the use of unique numbers associated with the devices.” Ex. 1001 at 2:7-11, 5:20-29; Ex. 1017 at [0003]-[0006], [0020]-[0022]. As explained in Mazor, a “PIN” is a dedicated device number that enables network communications via PIN-to-PIN messaging. Ex. 1017 at [0006]. A POSITA would understand that a PIN identifier may comprise any indicator that serves to identify a particular wireless device on a wireless network. Ex. 1017 at [0022]. Types of PIN-to-PIN messaging services include BlackBerry, Mobitex, DataTac, and SMS. Ex. 1017 at [0021] (“For example, SMS messages used by cell phones are also PIN-to-PIN messages.”).



**5. “network address” associated with the initiating mobile device (claims 1, 3, 8, 10, 15, 17) / other mobile device (claims 2, 9, 16)**

53. A POSITA would understand that “network address” is entitled to its ordinary meaning, which does not require a port. Ex. 1001 at claims 1, 3 (reciting that the network address “is” an IP address and not reciting a port). The claims recite that the “network address” is associated with a “device,” and a POSITA would understand that a port is not required for that association. The specification expressly recites “port” where a port is required. Ex. 1001 at 2:2-7. Similarly, related patents expressly recite “network address and port” in the claims where a port is required. Ex. 1016 at claim 1.

**E. Prior Art Publications**

54. My opinions directed to the invalidity of claims 1-20 of the 925 patent are based, at least in part, on the following prior art publications:

- “**Alos**” (Ex. 1005), which is EP 1 099 153 A1, published on June 14, 2000;
- “**Cordenier**” (Ex. 1007), which is EP 1 385 323 A1, published on January 28, 2004;
- “**Lee**” (Ex. 1006), which is U.S. Pat. No. 6,847,632, issued from an application filed on December 22, 1998;

- “**RFC793**” (Ex. 1010) – Request for Comment 793, published no later than 1992;
- “**SMS Specification**” (Ex. 1014) – SMS Specification, published no later than August 15, 2002;
- “**WMA**” (Ex 1018) – WMA, published no later than August 21, 2002; and,
- “**Dorenbosch**” (Ex 1011), which is U.S. Pat. App. Pub. No. – U.S. 2003/0217174, filed on May 15, 2002 and published on November 20, 2003.

55. As explained by Sandy Ginoza, RFC793 was indexed and published on a publicly available website and repository making it available and accessible to any interested person no later than October 1992. Ex. 1010 at 1-3 (original publication date of September 1981). As explained in the Internet Standards Process,

Each distinct version of an Internet standards-related specification is published as part of the “Request for Comments” (RFC) document series. This archival series is the official publication channel for Internet standards documents and other publications of the IESG, IAB, and Internet community. RFCs can be obtained from a number of Internet hosts using anonymous FTP, gopher,

World Wide Web, and other Internet document-retrieval systems.

Ex. 1024 at 10-11. I am familiar with RFCs based on my experience in the field, and anyone, including a POSITA, would have had access to, and would have been able to locate RFC793 no later than October 1992. Ex. 1024 at 10, 11. Indeed, the purpose of publishing Requests for Comments was to publicly solicit input from POSITAs for the standards setting processes. *Id.* RFC793 was in fact available and located by POSITAs, as established by its citation in contemporaneous documents. Ex. 1012 at 6:40-43 (U.S. Patent issued in 1992 and incorporating RFC793 by reference). Additionally, RFC793 was published to ensure that POSITAs implementing TCP did so in a uniform and interoperable manner. A POSITA would have been aware of, located, and referenced RFC793 in creating any implementation of TCP communications, like TCP/IP.

56. I have reviewed the declaration of Craig Bishop, and concur with his description of the standardization and publication process utilized by both ETSI and 3GPP. Ex. 1026 at ¶¶ 1-34 (detailing the development and publication of the SMS Specification by ETSI and 3GPP). In addition to the ETSI and 3GPP web sites, I note that multiple U.S. Patents reference, describe and point the interested public to the SMS Specification for implementation details regarding SMS. Ex. 1014 at 1-6 (IDS dated August 15, 2002); Ex. 1023 (U.S. Pat. App. Pub.

2003/0040300) at [0002]-[0013] (describing and pointing a POSITA to the SMS Specification, a copy of which was in the publicly available file history); Ex. 1025 (U.S. Pat. No. 7,181,231) at 1:21-2:45 (same). I am familiar with ETSI standards based on my experience in the field, and any member of the interested public, including a POSITA, would have had access to, and would have been able to locate the SMS Specification no later than August 15, 2002. Again, the purpose of publishing such standards during the standardization process was to facilitate adoption of those standards and to publicly solicit input from POSITAs for the standards setting processes. And once the standard is adopted, the standard was published so that POSITAs implementing the standard would do so according to the standard. SMS was ubiquitous in mobile devices in the prior art, and a POSITA implementing SMS on a GSM smartphone would have been aware of and referenced the SMS Specification itself.

57. As explained by Harold Ogle, WMA was indexed and published by the Java developers website no later than August 21, 2002. Ex. 1018 at 1 2, 6. I am familiar with Java standards based on my experience in the field, and anyone, including a POSITA, would have had access to, and would have been able to locate the WMA no later than August 21, 2002. Similarly to RFC 793 and the SMS Specification, the purpose of publishing the WMA (Wireless Messaging API)

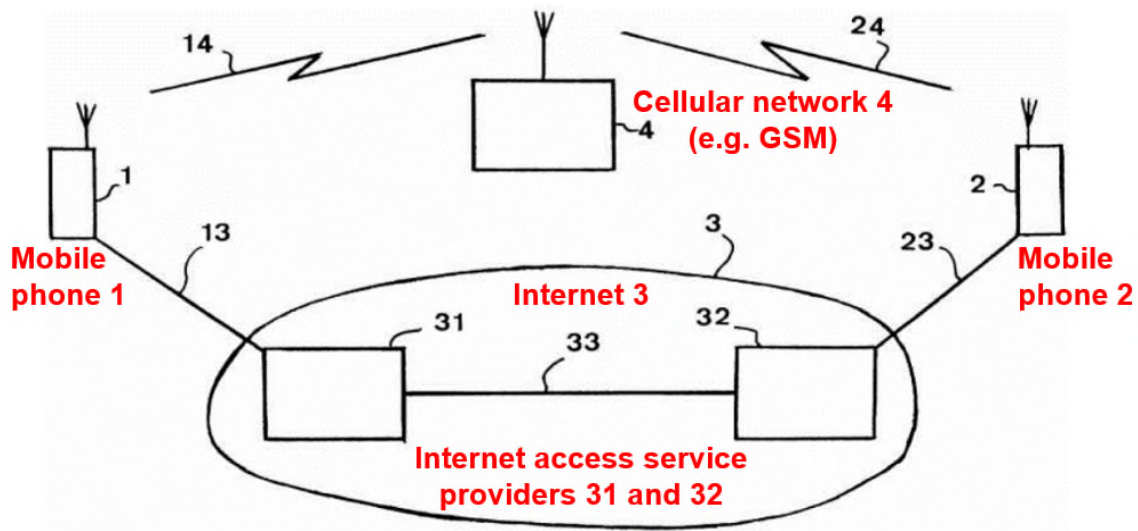
was to facilitate adoption of the platform, and to ensure that POSITAs implementing the standard did so according to the standard.

## VII. GROUND 1: THE COMBINATION OF ALOS AND RFC793 RENDERS OBVIOUS CLAIMS 1, 3-8, 10-15 AND 17-20

### A. Alos Overview

58. Alos discloses a technique for transferring data between mobile devices without an intermediating server. In Alos, mobile phones 1 and 2 are connected to a GSM cellular network 4 as shown in Fig. 1 below. Ex. 1005 at [0014]. Phones 1 and 2 are also connected to the Internet 3 through a wireless link (e.g. GSM) to Internet service providers 31, 32. Ex. 1005 at [0015]-[0016].

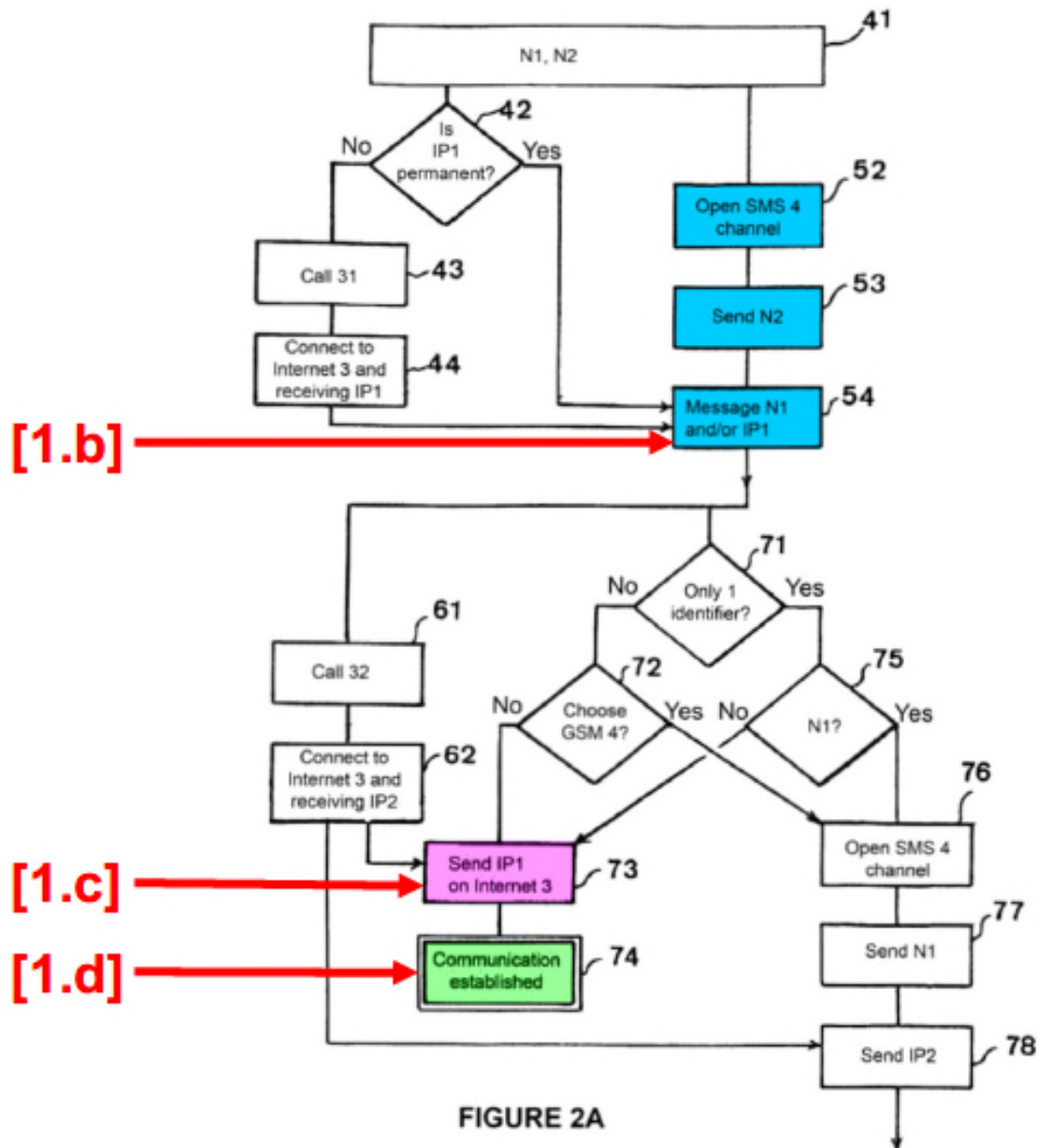
**Alos (Ex. 1005) Figure 1 (annotated)**



Ex. 1005 at Figure 1.

59. Alos discloses that phone 1 either has a permanent IP address or connects to the Internet to obtain a temporary IP address and then sends an SMS message containing that IP address (IP1) to phone 2. Ex. 1005 at [0025]-[0026]; *see also* Fig. 2A, steps 41-54. Upon receipt of the SMS message, phone 2 connects to the Internet, obtains a temporary IP address (IP2), and sends an IP-based reply message via Internet 3 to phone 1. Ex. 1005 at [0028]; *see also* Fig. 2A, steps 71-73. This IP-based reply message is addressed using IP1 (the IP address of phone 1 from the SMS message) and IP2 (the IP address of phone 2), such that a bidirectional IP connection is established over the Internet 3 between phone 1 and phone 2. *Id.*; *see also* Fig. 2A, step 74. These steps are highlighted in Figure 2A

below, with annotations for the corresponding claim steps in the 925 patent.



60. Thus, Alos expressly discloses all of the subject matter claimed in the 925 patent with two exceptions. First, Alos does not expressly disclose the use of ports as required in claims 1 and 2, but using ports to route incoming network

traffic to the correct process was obvious in light of the very standards that define the Internet and SMS networks disclosed in Alos. Second, Alos does not expressly disclose that the Internet connection is a TCP connection as claimed in claims 7, 14 and 20, but using TCP would have been obvious because TCP provides a standardized, widely supported, and reliable connection.

**B. RFC793 Overview**

61. An overview of RFC793 is provided above in Section VI.C.2.

**C. Rationale for Combining Alos and RFC793**

62. A POSITA would have been motivated to incorporate the use of TCP and TCP ports as disclosed in RFC793 in connection with Alos. In particular, Alos discloses that phone 2 responds to the SMS invitation message from phone 1 with an IP-based response message (Ex. 1005 at [0028] and Fig. 2A, steps 71-73), but does not disclose what transport layer protocol to use for that IP-based response message. Thus, in implementing the IP-based response message disclosed in Alos, a POSTIA would have been motivated to select an appropriate transport layer protocol, which would have led them to consider and use TCP. Ex. 1009 at 12 (“To communicate using the Internet system, a host must implement the layered set of protocols comprising the Internet protocol suite. A host typically must implement at least one protocol from each layer.”), 13 (“The transport layer provides end-to-end communication services for applications. There are two



primary transport layer protocols at present: - Transmission Control Protocol (TCP) [and] - User Datagram Protocol (UDP).”)

63. A POSITA would have been motivated to use TCP to implement the communications disclosed by Alos because wireless communication links, like those in Alos, are less reliable than wired links, and TCP was a well-known technique for providing reliability for IP communications. A POSITA would understand that IP by itself is not reliable and doesn’t guarantee delivery of a packet. TCP adds header information that enables hosts to (1) ensure that every packet is received (and request retransmission of dropped packets), and (2) to correctly order the packets (since they might be received out of order). Ex. 1010 at 13. Using TCP to was well known and standardized in RFC793, such that a POSITA would have had a reasonable expectation of success of achieving the predictable result of reliable TCP/IP communications. Furthermore, a POSITA would have understood that UDP is not a reliable transport protocol, and that the use of UDP to transmit messages does not guarantee delivery of data, and would therefore be unsuitable for establishing a connection between the mobile phones 1 and 2 such as would be required to , e.g., transmit a file or update a database. Ex. 1027 (RFC768: UDP) at 5 (“The protocol is transaction oriented, and delivery and duplicate protection are not guaranteed. Applications requiring ordered

reliable delivery of streams of data should use the Transmission Control Protocol (TCP)").

64. Alos discloses that the data communication can comprise sending a predetermined file or updating a database element. Ex. 1005 at [0001], [0028]. A POSITA would have been particularly motivated to use TCP/IP for transferring a file and updating a database element as disclosed in Alos to ensure that the file is transferred correctly and the database is updated correctly. Alos also discloses that its protocol can be used for voice transmission. Ex. 1005 at [0001]. A POSITA would have been motivated to use TCP/IP for at least the control channels for such voice transmissions to ensure the voice transmission is set up correctly. This is in contrast to the other transmissions, where a POSITA might have found an unreliable protocol like UDP (the other primary transport layer protocol) sufficient. Moreover, TCP was well-known and widely supported, and software for TCP implementations was widely available.

65. A POSITA would also have been motivated to configure phone 1 to make a passive OPEN call to open a TCP port in a listen mode because, if the TCP port on phone 1 were not opened, the TCP response message from phone 2 could not be received and processed. Ex. 1010 at 20, 45 ("If the connection does not exist (CLOSED) then a reset is sent in response to any incoming segment except

another reset. In particular, [requests to connect] addressed to a non-existent connection are rejected by this means.”).

66. A POSITA would understand that this port likely would either be assumed (e.g., a well-known port) or would be expressly included in the SMS invitation. In some implementations, the POSITA developing the Alos communication software on the various mobile devices would know in advance which port an initiator would open and which port the responder would use for the response. This is the case with the admittedly well-known ports such as FTP, telnet, http, etc.

67. In other implementations, a POSITA would have been motivated to have the initiating device expressly include the TCP port in the invitation message with the IP address. This was a known technique when port numbers were not known in advance. Ex. 1021 at 72 (“6.40.1 Requests. The client originating the request MUST insert into the request a Via field containing its host name or network address and, if not the default port number, the port number at which it wishes to receive responses.”). Additionally, a POSITA would have understood that it was possible for multiple processes on phone 1 to utilize TCP/IP communications, such as separate voice, file transfer, and database applications to handle the corresponding communications described by Alos. Ex. 1005 at [0001], [0028]. A POSITA would have understood that each of the applications could be

assigned their own port number, such that the port number for the type of communication sought would be expressly included in each individual SMS invitation. A POSITA would also have been motivated to expressly include the TCP port number in the SMS invitation because this would provide robustness for increased compatibility and flexibility in multi-application environments and future implementations.

#### **D. Detailed Claim Analysis**

- 1. Claim 1.pre: “A method of establishing a direct data transfer session between mobile devices that support a data packet-based communications service over a digital mobile network system, the method comprising”**

**Claim 8.pre: “A mobile device enabled to establish a direct data transfer session with other mobile devices in a digital mobile network system, the mobile device comprising a processor configured to perform the steps of”**

**Claim 15.pre: “A non-transitory computer-readable storage medium including instructions that, when executed on a processor of a mobile device that supports a data packet-based communications service over a digital mobile network system, causes the processor to establish a direct data transfer session by performing the steps of”**

68. To the extent these preambles are limiting, they are disclosed by Alos.

With respect to claim 1, Alos discloses a method of establishing a direct data transfer session between mobile devices (mobile phones 1 and 2), that support a data packet-based communications service (IP), over a digital mobile network system (Internet 3 accessed over the wireless network 4). *See* claims 1.a-1.d

below; Ex. 1005 at Figs. 2A-B, [0001], [0015], [0036]. With respect to claim 8, Alos discloses a mobile device (phone 1) enabled to establish a direct data transfer session with other mobile devices (e.g., phone 2), and that the mobile device (phone 1) includes a processor configured to perform the disclosed protocol. *Id.* at [0035] (“microprocessor for automatically managing the above protocol”). With respect to claim 15, because Alos’s phone 1 includes a microprocessor to perform the disclosed protocol, it is inherent that Alos’s phone 1 also includes a non-transitory computer-readable storage medium including instructions for that microprocessor because the disclosed protocol cannot be performed by a microprocessor without such storage medium and instructions. Ex. 1003 at 335-36 (admitting programs inherently contain instructions). In the alternative, providing a non-transitory computer-readable storage medium including instructions as recited in the preamble would have been obvious, because a POSITA would have been motivated to do so to cause the microprocessor disclosed in Alos to perform the protocol disclosed in Alos. Providing instructions in memory to cause the microprocessor to perform the disclosed functions is the most obvious way to implement the functionality in the hardware architecture disclosed by Alos. A POSITA would understand a program to consist of instructions and that it would be stored in a memory that could be read by the disclosed processor.

**2. Claim 1.a, 8.a, 15.a: “opening a software listening port on an initiating mobile device to receive communications through the data packet-based communications service”**

69. Alos in combination with RFC793 renders this limitation obvious.

Alos discloses that the response from phone 2 is sent to phone 1 as an IP-based response message over the Internet 3 and does not specify a transport layer protocol for that message. Ex. 1005 at [0028] and Fig. 2A, step 73. As established above in Sections VI.C.2. and VII.C., it would have been obvious to a POSITA to use TCP as the transport protocol for the IP-based response because TCP/IP was well-known, widely supported, and would provide reliability. It would have been obvious to a POSITA to configure phone 1 to passively open a TCP port in a listening state with an unspecified foreign host so that the TCP/IP response message from the as-yet unknown socket address at phone 2 could be received at phone 1. Ex. 1010 at 20, 45; *supra* Sections VI.C.2 (establishing how the RFC793 teaches that TCP ports must be opened to receive messages and applicant’s admissions during prosecution that opening such ports was well known).

**3. Claim 1.b, 8.b, 15.b: “transmitting an invitation message to a target mobile device through a page-mode messaging service, wherein the invitation message comprises a network address associated with the initiating mobile device, and wherein the target mobile device is located by providing a unique identifier to the page-mode messaging service”**

70. Alos discloses initiating mobile device (phone 1) transmitting an invitation message (an SMS message) to a target mobile device (phone 2) through

a page-mode messaging service (the SMS service on the GSM network 4).

Ex. 1005 at Figs. 2A-B (steps 52-54), [0020], [0026].

71. Alos discloses that the SMS message includes IP1, the network address of phone 1 on Internet 3. Ex. 1005 at Figs. 2A-B (step 54), [0020], [0026].

72. Alos discloses that phone 2 is located by providing a unique identifier (telephone number N2) to the page-mode messaging service (SMS). Ex. 1005 at [0018], [0026] (“called number N2”); *see also* Ex. 1014 at 42-43, 48-51 (describing the destination address in the SMS header).

73. Additionally, while not necessary for “network address” as properly construed, it would have been obvious to a POSITA to include a TCP port number in the SMS invitation message along with the network address IP1 to ensure that the TCP/IP response message from phone 2 was directed to the correct TCP port on phone 1, as established above in Sections VI.C.2. and VII.C.

**4. Claim 1.c, 8.c, 15.c: “receiving a response from the target mobile device at the listening software port on the initiating mobile device”**

74. Alos in combination with RFC793 renders this limitation obvious. Alos discloses initiating mobile device (phone 1) receiving, at IP1, a response to the SMS invitation message from the target mobile device (phone 2) via the data packet-based communications service (Internet 3). Ex. 1005 at Figs. 2A-B (step 73), [0020]-[0021], [0028]-[0029]. As established above with respect to claim 1.a

and in Sections VI.C.2. and VII.C, it would have been obvious to implement the response using TCP/IP and, therefore, to receive it at the previously opened TCP listening port.

5. **Claim 1.d, 8.d, 15.d: “establishing a data transfer session through the data packet-based communications service between the initiating mobile device and the target mobile device, wherein the data transfer session is established in a peer-to-peer fashion without a server intermediating communications through the established data transfer session between the initiating mobile device and the target mobile device”**

75. Alos in combination with RFC793 renders this limitation obvious.

Alos discloses establishing voice and data transfer sessions through Internet 3 using the respective IP addresses of the mobile phones. Ex. 1005 at [0001], [0006]-[0007], [0021], [0028], [0030]-[0035]. In the combination of Alos and RFC793, this data transfer session uses TCP/IP as established above for reliability. Because the devices address the TCP/IP packets to each other using their actual IP addresses, this is a peer-to-peer communication without an intermediating server, precisely as disclosed in the 925 specification. Alos expressly recognizes the advantage that no appointment server is necessary. Ex. 1005 at [0008].



6. **Claims 3, 10, 17: “The [method of claim 1/mobile device of claim 8/non-transitory computer-readable storage medium of claim 15], wherein the network address of the initiating mobile device is an IP address”**

76. Alos discloses that the network address of the initiating mobile device is an IP address, specifically, IP1 on Internet 3. Ex. 1005 at Figs. 2A-B (step 54), [0020], [0026].

7. **Claims 4, 11, 18: “The [method of claim 1/mobile device of claim 8/non-transitory computer-readable storage medium of claim 15], wherein the page-mode messaging service is SMS”**

77. Alos discloses that the page-mode messaging service is SMS.  
Ex. 1005 at Figs. 2A-B (steps 52-54), [0020], [0026].

8. **Claims 5, 12: “The [method of claim 1/mobile device of claim 8], wherein the page-mode messaging service is a PIN-to-PIN messaging service”**

78. Alos discloses that the page-mode messaging service is SMS.  
Ex. 1005 at Figs. 2A-B (steps 52-54), [0020], [0026]. SMS is a species of the claimed genus of “PIN-to-PIN messaging service” as properly construed, because SMS uses the unique phone number (e.g., N2) of the target device to transmit information over the wireless network. *See, e.g.*, Ex. 1017 at [0021] (“SMS messages used by cell phones are also PIN-to-PIN messages.”).

**9. Claims 6, 13, 19: “The [method of claim 1/mobile device of claim 8/non-transitory computer-readable storage medium of claim 15], wherein the unique identifier is a telephone number”**

79. Alos discloses that the unique identifier is the telephone number (N2) used to address the SMS message. Ex. 1005 at [0018], [0026] (“called number N2”); *see also* Ex. 1014 at 42-43, 48-51 (describing the destination address in the SMS header).

**10. Claims 7, 14, 20: “The [method of claim 1/mobile device of claim 8/non-transitory computer-readable storage medium of claim 15], wherein the data transfer session utilizes a TCP connection”**

80. As established above, it would have been obvious to a POSITA to use TCP as disclosed in RFC793 as the transport protocol for the IP-based data transfer sessions disclosed in Alos because TCP/IP was well-known, widely supported, and provided reliability. *See supra* Sections VI.C.2, VII.C.

**VIII. GROUND 2: THE COMBINATION OF ALOS, RFC793, WMA AND THE SMS SPECIFICATION RENDERS CLAIMS 2, 9 AND 16 OBVIOUS**

**A. SMS Specification Overview**

81. The SMS Specification describes the Short Message Service (SMS), including protocols and protocol layering. Ex. 1014 at 13-14. The SMS Specification describes application port addressing. Ex. 1014 at 66-69, 72-73. As discussed above in Section VI.C.3, the SMS Specification discloses that SMS ports

work similarly to TCP/IP ports, and SMS supports both 8-bit and 16-bit port addresses. *Id.*

## **B. WMA Overview**

82. WMA describes the message API included in the JSR (Java Specification Request) 120 Wireless Messaging API specification, and also describes Sun Microsystem's reference implementation of the API. Ex. 1018 at 9. In other words, WMA describes an implementation by Sun Microsystems of code for an API that can be used by an application to send and receive wireless messages over services such as SMS. Ex. 1018 at 21.

## **C. Rationale for Combining Alos, RFC793, the SMS Specification and WMA**

83. Alos discloses that either of phones 1 and 2 can initiate communications with the other. Therefore, phone 1 can also receive SMS invitations from phone 2 and transmit an IP-based response thereto in order to create a data connection. Ex. 1005 at [0022].

84. Alos discloses that the SMS message "orders" and "specif[ies]" that the receiving device use the transmitted IP address to respond with an IP message, and that these operations be performed automatically, prior to alerting the user. Ex. 1005 at [0020], [0026], [0035]. However, Alos does not expressly articulate how the receiving phone should distinguish these SMS invitation messages from regular SMS messages that merely are displayed. A POSITA would have been

aware that the SMS standard disclosed SMS port addressing that (like TCP port addressing) allowed SMS messages to be directed to specific applications.

Ex. 1014 at 66-69, 72-73. A POSITA would have understood that a generic SMS application would not have supported the new Alos protocol, and would have been motivated to use SMS port addressing on phone 2 to receive and route Alos's SMS invitation messages to an application designed to support the Alos protocol. A POSITA would have been motivated to implement SMS port addressing to isolate the Alos-specific application from the carrier's standard SMS application.

85. A POSITA would have further been motivated to open an SMS port in listen mode in connection with the SMS invitation message as disclosed in WMA in order to receive such a message. Ex. 1018 at 21, 27, 30-34, 37-45 (*e.g.*, at 44 “The first application to allocate a given port number will get it.”). In particular, a POSITA would have been motivated to configure the separate application on phone 1 to open the SMS port with which the separate application is associated in the listen mode in order to ensure that an incoming SMS invitation message is properly received and routed to the appropriate application as disclosed in WMA. A POSITA would further have understood that such an SMS port number for the invitation message would have been known in advance by mobile phones 1 and 2 (and other phones utilizing Alos's protocol). A POSITA would have been motivated to incorporate the functionality disclosed in WMA of making calls to

open ports in a listening mode, and it would have been well within their skill to do so, as a POSITA would have been familiar with such functionality in the context of both SMS and TCP ports. Notably, the 925 patent merely states that software listening ports may be opened, and relies entirely on the knowledge of a POSITA to implement that functionality.

#### **D. Detailed Claim Analysis**

- 1. Claims 2.pre (“The method of claim 1 further comprising:”), 9.pre (“The mobile device of claim 8 wherein the processor is further configured to perform the steps of:”), 16.pre: (“The non-transitory, computer-readable storage medium of claim 15, further including instructions that cause the processor to perform the steps of:”)**

86. These dependent claims require that the initiating mobile device of claim 1 (phone 1 in the preceding Ground) receive and respond to an invitation from another device. Alos discloses that each of phone 1 and phone 2 can initiate and respond to SMS invitations. Ex. 1005 at [0022]. Thus, a POSITA would have understood that phone 1, the initiating mobile device for claim 1, can also receive and respond to invitations from phone 2 (or any other Alos-enabled device) using the functionality relied on above in claims 1.pre-1.d.

- 2. Claims 2.a, 9.a, 16.a: “opening a second listening software port on the initiating mobile device to receive invitation messages through the page-mode messaging service”**

87. The combination of Alos, the SMS Specification, and WMA renders this limitation obvious. Alos discloses that the initiating mobile device (phone 1)

can receive invitation messages (SMS invitations) through the page-mode messaging service (SMS). *See* claim 1.b; Ex. 1005 at [0022]. Alos discloses that the SMS invitation can “order” the recipient to respond but does not disclose how that functionality would have been implemented between SMS application and other software. Ex. 1005 at [0020].

88. It would have been obvious to a POSITA to configure Alos’s phones to open a passive listener on an SMS port (e.g., WDP Port) as taught in the SMS Specification and WMA in order to ensure that an incoming SMS invitation message described by Alos is received by the standard SMS application and routed to the Alos-application configured to respond to such invitation messages. *See supra* Section VIII.C (establishing it would have been obvious to open an SMS port); Ex. 1014 at 66-69, 72-73; Ex. 1018 at 21, 27, 30-34, 37-45. Thus, a POSITA would also have found it obvious to open an SMS port (the second listening software port) on phone 1 (the initiating mobile device of claim 1) to receive SMS invitation messages in order to ensure that they are properly received and processed.

**3. Claims 2.b, 9.b, 16.b: “receiving, at the second listening software port and through the page-mode messaging service, a message from another mobile device inviting the initiating mobile device to establish a data transfer session, wherein such message comprises a network address associated with the other mobile device”**

89. As established immediately above for claim 2.a, it would have been obvious to receive, at the second listening software port (WDP Port) and through the page-mode messaging service (SMS) a message (SMS invitation) from another mobile device (phone 2) inviting the initiating mobile device (phone 1) to establish a data transfer session (e.g. voice or data transmission over the Internet). *See*, claim 1.b; Ex. 1005 at [0001], [0022].

90. Alos discloses wherein such message (SMS invitation) comprises a network address (IP address IP2) associated with the other mobile device (phone 2). *See*, claim 1.b; Ex. 1005 at [0022].

**4. Claims 2.c, 9.c, 16.c: “transmitting a response to the network address associated with the other mobile device, wherein the response acknowledges the ability to establish a data transfer session”**

91. Alos discloses transmitting a response (IP message via Internet 3) to the network address (IP2) associated with the other mobile device (phone 2). *See* claim 1.c; Ex. 1005 at [0022].

92. Alos discloses wherein the response acknowledges the ability to establish a data transfer session. Specifically, Alos discloses that the response

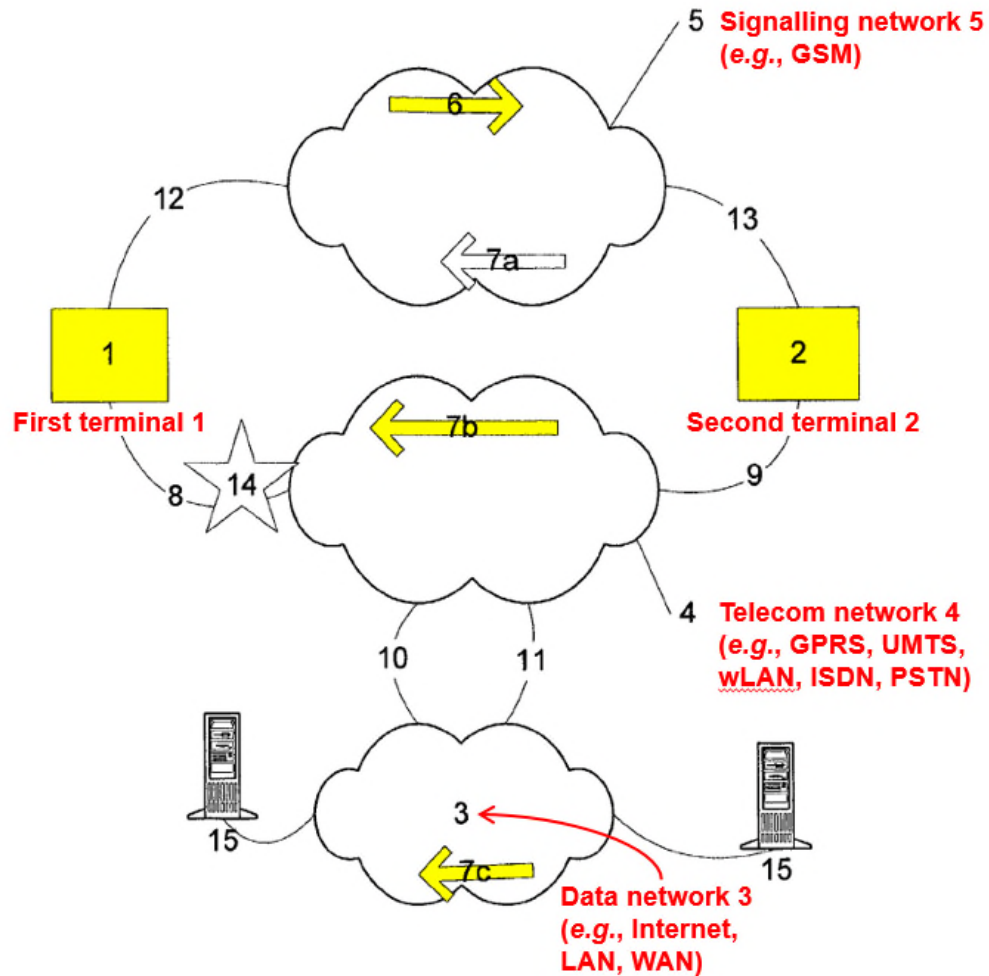
message includes the IP address of the responding device, acknowledging that the responding device can engage in IP communication at that address. Ex. 1005 at Figs. 2A-B (step 73), [0020]-[0021], [0028]-[0029]. Furthermore, in the combination of Alos with RFC793, the response is the initiation of a TCP/IP connection. *See, e.g.*, RFC793 at Figure 7 (messages 2 and 4). This is the same “acknowledgement” disclosed in the 925 patent. Ex. 1001 at Fig. 2 (step 260); Fig. 3 (step 350).

## **IX. GROUND 3: THE COMBINATION OF CORDENIER AND RFC793 RENDERS OBVIOUS CLAIMS 1, 3-8, 10-15 AND 17-20**

### **A. Cordenier Overview**

93. Cordenier discloses “[a] system, a method and apparatus for peer-to-peer exchange of information” that eliminates the need for any exchange server. Ex. 1007 at Title, 2:29-33. Cordenier discloses a first terminal 1 and a second terminal 2 (e.g., wireless telephones) that are connected to each other by a signaling network 5 (e.g., a GSM network implementing SMS), and a data network 3 (e.g., the Internet) that can be reached by each of the terminals via a telecom network 4 (e.g., a cellular network such as GPRS, alone or in combination with a fixed telephone network). *Id.* at Fig. 6, 6:19-54.





Ex. 1007 at Fig. 6 (annotations and highlighting added).

94. In one embodiment, Cordenier discloses that the first terminal 1 sends an SMS message 6 including the IP address of the first terminal 1 to the second terminal 2 via the signaling network 5. *Id.* at 6:44-57. Upon receiving the SMS message 6, the second terminal 2 sends a message including the IP address of the second terminal 2 to the first terminal 1. *Id.* at 7:2-19. Cordenier discloses that this message may be sent via one of three ways: as an SMS message (message 7a), via the telecom network 4 (message 7b), or through the data network 3 which is

reached via the telecom network 4 using channels 9, 11, 10 and 8 (message 7c). *Id.* at 7:20-37. Once the first terminal 1 receives the response message from the second terminal 2 containing the network address of terminal 2 (*id.* at 7:14-19, 7:54-56), the first terminal 1 may start exchanging data with the second terminal 2 via the data network 3. *Id.* at 7:54-8:2.

### **B. Rationale for Combining Cordenier and RFC793**

95. A POSITA would have been motivated to incorporate the use of TCP and TCP ports as disclosed in RFC793 in connection with the peer-to-peer exchanges disclosed by Cordenier. Cordenier discloses that mobile phone 2 may respond to the SMS invite by sending an IP-based response 7c via data network 3, which may be the Internet. Ex. 1007 at 1:17-36, 7:14-15, 7:20-37, 10:17-19, 13:4-11. Cordenier is silent as to the transport layer protocol for response 7c and the ensuing data exchange, leading a POSITA to consider well-known protocols. A POSITA would have been motivated to use TCP/IP for the response 7c and ensuing data exchanges over Internet 3. Ex. 1009 at 12-13 (explaining that Internet hosts must implement a transport layer, and that the two most prominent transport layers TCP and UDP).

96. A POSITA would have been motivated to use TCP to implement the IP communications disclosed in Cordenier as TCP/IP communications because wireless communication links, like those in Cordenier, are less reliable than wired

links, and TCP was a well-known and widely supported technique to provide reliable communications as established in Section VI.C.2 (explaining TCP); Ex. 1009 at 12-13. A POSITA would be motivated to use a reliable protocol like TCP/IP for response 7c to ensure that the peer-to-peer communications were set up correctly, and for the types of peer-to-peer communications disclosed in Cordenier to make sure the data is transferred correctly. Ex. 1007 at 1:18-26 (file and document exchange, chat), 7:47 (chat), 9:30-41 (texting), 10:40-41 (transfer files); see Ex. 1010 at 10-14, 16-19,. Furthermore, a POSITA would have understood that UDP is not a reliable transport protocol, and that the use of UDP to transmit messages does not guarantee delivery of data, and would therefore be unsuitable for establishing a connection to transmit a file or document. Ex. 1027 (RFC768: UDP) at 5 (“The protocol is transaction oriented, and delivery and duplicate protection are not guaranteed. Applications requiring ordered reliable delivery of streams of data should use the Transmission Control Protocol (TCP)”).

97. A POSITA would have been motivated to configure terminal 1 to make a passive OPEN call to open a TCP port in listen mode because, if the TCP port on terminal 1 were not opened, the TCP/IP response message 7c could not be received and processed. Ex. 1010 at 20, 45.

98. A POSITA would have understood that the TCP/IP port would have been either assumed by terminal 1 and 2 (e.g., a well-known port) or it would have

been expressly included in the SMS invitation along with the IP address. E.g., Ex. 1011 at [0022], [0029]. In other implementations, a POSITA would have been motivated to have the initiating device expressly include the TCP port in the invitation message with the IP address. This was a known technique when port numbers were not known in advance. Ex. 1021 at 72. A POSITA would have been motivated to expressly include the TCP port number in the SMS invitation as one way to indicate which of the particular peer-to-peer communication applications disclosed in Cordenier should send the response 7c. Moreover, a POSITA would also have been motivated to expressly include the TCP port number in the SMS invitation because this would provide robustness for increased compatibility and flexibility in multi-application environments and future implementations.

### **C. Detailed Claim Analysis**

- 1. Claim 1.pre: “A method of establishing a direct data transfer session between mobile devices that support a data packet-based communications service over a digital mobile network system, the method comprising”**

**Claim 8.pre: “A mobile device enabled to establish a direct data transfer session with other mobile devices in a digital mobile network system, the mobile device comprising a processor configured to perform the steps of”**

**Claim 15.pre: “A non-transitory computer-readable storage medium including instructions that, when executed on a processor of a mobile device that supports a data packet-**

**based communications service over a digital mobile network system, causes the processor to establish a direct data transfer session by performing the steps of”**

99. To the extent these preambles are limiting, they are disclosed by Cordenier. With respect to claim 1, Cordenier discloses a method of establishing a direct data transfer session between mobile devices (first terminal 1 and second terminal 2) that support a data packet-based communications service (IP), over a digital mobile network system (Internet 3 accessed via, e.g., GPRS and channels 8-11). (*see* claim 1.a-1.d below). Ex. 1007 at Fig. 6, 2:29-33, 6:6-54. With respect to claim 8, Cordenier discloses a mobile device (first terminal 1) enabled to establish a direct data transfer session with other mobile devices (e.g., second terminal 2), that the mobile device (first terminal 1) and Cordenier’s first terminal 1 and second terminal 2 each include a processor (“processing unit”) configured to perform the disclosed protocol. *Id.* at 3:38-4:10, 4:24-54, 4:58-5:11, 6:6-7:53, 10:32-11:5. With respect to claim 15, because Cordenier’s first terminal 1 includes “a processing unit that can be programmed for performing the functions described in this document” (*id.* at 10:52-55, 6:6-7:53), and because those terminals include a memory (*id.* at 10:25-25 and 6:9-18), it is inherent that Cordenier’s terminals include a non-transitory computer-readable storage medium including instructions for the processor because the disclosed functions cannot be performed by a processor without such storage medium and such instructions. Ex. 1003 at 335-36

(admitting that a “computer program” inherently discloses a computer readable storage medium). In the alternative, providing a non-transitory computer-readable storage medium including instructions as recited in the preamble would have been obvious, because a POSITA would have been motivated to do so to cause the processor disclosed in Cordenier to perform the functions disclosed in Cordenier. Providing instructions in memory to cause the microprocessor to perform the disclosed functions is the most obvious way to implement the functionality in the hardware architecture disclosed by Cordenier. A POSITA would understand a program to consist of instructions and that it would be stored in a memory that could be read by the disclosed processor.

**2. Claim 1.a, 8.a, 15.a: “opening a software listening port on an initiating mobile device to receive communications through the data packet-based communications service”**

100. Cordenier, in combination with RFC793, renders this limitation obvious. Cordenier discloses that a response message 7c from the terminal 2 is sent to the terminal 1 as an IP-based response message over the Internet and does not specify a transport layer protocol for that message. Ex. 1007 at 7:20-37. It would have been obvious to a POSITA to use TCP as the transport protocol for the IP-based response, because TCP/IP was well-known, widely supported, and would provide reliability. *See supra*, Section IX.B. It would have been obvious to a POSITA to configure terminal 1 to passively open a TCP port in a listening state

with an unspecified foreign host so that the TCP/IP response message from the as-yet unknown socket address at terminal 2 could be received at terminal 1. Ex. 1010 at 20, 45; *supra*. Section VI.C.2 (establishing how the RFC793 teaches TCP ports must be opened to receive messages and applicant's admissions during prosecution that opening such ports was well known).

**3. Claim 1.b, 8.b, 15.b: “transmitting an invitation message to a target mobile device through a page-mode messaging service, wherein the invitation message comprises a network address associated with the initiating mobile device, and wherein the target mobile device is located by providing a unique identifier to the page-mode messaging service”**

101. Cordenier discloses initiating mobile device (terminal 1) transmitting an invitation message (SMS message 6) to a target mobile device (terminal 2). Ex. 1007 at Fig. 6, 6:44-57, 7:2-8, 7:20-26, 8:27-45, 9:15-20, 13:4-25, 15:1-22.

102. Cordenier discloses that the SMS message 6 includes the “first data network address” of terminal 1 on data network 3, which Cordenier discloses is an “IP-address.” *Id.* at 2:43-45 (“IP-address”), 6:44-51, 7:9-15, 8:46-9:5, 13:4-11, 14:56-15:8.

103. Cordenier discloses that terminal 2 is located on GSM network 5 by providing a unique identifier (its MSISDN (*i.e.* telephone number)) to the page-mode messaging service (SMS). *Id.* at Fig. 6, 8:27-45; Ex. 1014 at 42-43, 113.

104. Additionally, while not necessary for “network address” as properly construed, it would have been obvious to a POSITA to include a TCP port number in the SMS invitation to ensure that the TCP/IP response is directed to the correct port/application as established above in Sections VI.C.2 and IX.B.

**4. Claim 1.c, 8.c, 15.c: “receiving a response from the target mobile device at the listening software port on the initiating mobile device”**

105. Cordenier in combination with RFC793 renders this limitation obvious. Cordenier discloses terminal 1 receiving response 7c from terminal 2 via the data network 3. Ex. 1007 at Fig. 6, 7:16-19, 7:31-37, 8:53-57, 12:38-43, 14:30-36. As established above with respect to claim 1.a, it would have been obvious to implement response 7c using TCP/IP and, therefore, to receive response 7c at the previously opened TCP listening port.

**5. Claim 1.d, 8.d, 15.d: “establishing a data transfer session through the data packet-based communications service between the initiating mobile device and the target mobile device, wherein the data transfer session is established in a peer-to-peer fashion without a server intermediating communications through the established data transfer session between the initiating mobile device and the target mobile device”**

106. Cordenier in combination with RFC793 renders this limitation obvious. Cordenier discloses establishing various types of data transfer sessions via network 4 (e.g., GPRS), channels 8-11 and the data network 3. Ex. 1007 at Fig. 6, 1:18-26 (file and document exchange, chat), 7:47 (chat), 9:30-41 (texting),



10:40-41 (transfer files). It would have been obvious to a POSITA to implement this session using TCP/IP for reliability. *See supra*, Section IX.B. Because the devices address the TCP/IP packets to each other using their actual IP addresses, this is a peer-to-peer communication without an intermediating server, precisely as disclosed in the 925 specification. *Id.* at Title (“peer-to-peer”), 2:13-33, 8:46-9:5, 9:30-41, 10:8-31.

107. Cordenier additionally discloses the potential use of NATs (Figs. 7-8, 8:3-26, 9:51-10:7), but that additional disclosure relates to alternative embodiments, which are not relevant to my opinion.

**6. Claims 3, 10, 17: “The [method of claim 1/mobile device of claim 8/non-transitory, computer-readable storage medium of claim 15], wherein the network address of the initiating mobile device is an IP address”**

108. Cordenier discloses that the network address of the initiating mobile device is an IP address. Ex. 1007 at 2:43-45 (“IP-address”), 7:9-15, 8:46-9:5, 13:4-11.

**7. Claims 4, 11, 18: “The [method of claim 1/mobile device of claim 8/non-transitory computer-readable storage medium of claim 15], wherein the page-mode messaging service is SMS”**

109. Cordenier discloses that the page-mode messaging service is SMS. Ex. 1007 at Fig. 6, 6:44-57 (“SMS message”), 7:20-26, 9:15-20, 13:4-25 (“SMS protocol”).

**8. Claims 5, 12: “The [method of claim 1/mobile device of claim 8], wherein the page-mode messaging service is a PIN-to-PIN messaging service”**

110. Cordenier discloses that the page-mode messaging service is SMS. Ex. 1007 at Fig. 6, 6:44-57 (“SMS message”). SMS is a species of the claimed genus of “PIN-to-PIN messaging service” as properly construed, because SMS uses the unique phone number (e.g., MSISDN) of the target device to transmit information over the wireless network. *See, e.g.*, Ex. 1017 at [0021] (“SMS messages used by cell phones are also PIN-to-PIN messages.”).

**9. Claims 6, 13, 19: “The [method of claim 1/mobile device of claim 8/non-transitory computer-readable storage medium of claim 15], wherein the unique identifier is a telephone number”**

111. Cordenier discloses that the unique identifier is the telephone number (MSISDN) used to address the SMS message. Ex. 1007 at 8:27-45; Ex. 1014 at 42-43, 113.

**10. Claims 7, 14, 20: “The [method of claim 1/mobile device of claim 8/non-transitory computer-readable storage medium of claim 15], wherein the data transfer session utilizes a TCP connection”**

112. As established above, it would have been obvious to a POSITA to use TCP as disclosed in RFC793 as the transport protocol for the IP-based data transfer sessions disclosed in Cordenier because TCP/IP was well-known, widely supported, and would provide reliability. *See supra* Sections VI.C.2. and IX.B.

**X. GROUND 4: THE COMBINATION OF CORDENIER, RFC793 AND DORENBOSCH RENDERS CLAIMS 2, 9 AND 16 OBVIOUS**

**A. Overview of Dorenbosch**

113. Dorenbosch discloses a server sending a WAP Push over SMS containing the IP address and port of a host 105 to a mobile station 103. Ex. 1011 at Fig. 3 (steps 307, 309), [0022] (“host IP address and port number where a response is expected”), [0029], [0031], [0035]. A WAP Push over SMS is directed to the WDP port, which is the SMS port used for WAP Pushes. *Id.* at [0031]. Thus, Dorenbosch provides a specific example of the use of an SMS port, as discussed above for Ground 2. When the mobile station 103 receives the WAP Push on the WDP port, it is directed to the OTA-WAP layer, then the encapsulated SIP application ID is extracted, and then the message is forwarded to the SIP application for processing. *Id.* at [0036]. The SIP application processes the message and responds to the host 105 with an IP-based SIP message “200 OK.” *Id.* at Fig. 3 (step 315), [0036]. Dorenbosch teaches that using the WDP port as an intermediary is more widely implemented than routing to the application directly. *Id.* at [0033].

**B. Rationale for Combining Cordenier, RFC793 and Dorenbosch**

114. It would have been obvious to combine Cordenier and RFC793 as established in the preceding Ground, and it would have been obvious to further combine them with Dorenbosch because Dorenbosch discloses WAP Push

implementation details lacking in Cordenier. Specifically, Cordenier discloses that the SMS invitation messages are implemented as a lightweight WAP Push. Ex. 1007 at 7:38-53, 9:42-50. As established immediately above, Dorenbosch discloses that WAP Pushes are implemented over SMS by opening a WDP Port. Furthermore, Cordenier teaches that sub-addressing may be used in sending a message (Ex. 1007 at 6:49-53<sub>[BE1]</sub>), and Dorenbosch details how that sub-addressing can use the WDP Port. Notably, the 925 patent admits that receiving a WAP Push over SMS and responding via TCP/IP was known in the art. Ex. 1001 at 1:23-57. Thus, it would have been obvious to a POSTIA implementing Cordenier's lightweight WAP Push to open a software listening port (the WDP Port) to receive those invitations as taught by Dorenbosch.

### **C. Detailed Claim Analysis**

- 1. Claims 2.pre (“The method of claim 1 further comprising:”), 9.pre (“The mobile device of claim 8 wherein the processor is further configured to perform the steps of:”), 16.pre: (“The non-transitory, computer-readable storage medium of claim 15, further including instructions that cause the processor to perform the steps of:”)**

115. These dependent claims require that the initiating mobile device of claim 1 (terminal 1 in the preceding Ground) receive and respond to an invitation from another device. A POSITA would understand that terminals 1 and 2 are identical and Cordenier's disclosure of terminal 1 as the initiating device is only exemplary. Cordenier describes that the terminals are “peers” (Ex. 1007 at Title),

with the same structure (*id.* at 6:6-6:30), that each can receive an SMS message with the other's IP-address prior to initiating an IP connection (*id.* at 6:44-52, 7:20-26), and that each terminal can send information to the other (*id.* at 5:30-33). Thus, a POSITA would have understood that terminal 1, the initiating mobile device for claim 1, can also receive and respond to invitations from terminal 2 (or any other Cordenier-enabled device) using the functionality relied on above in claims 1.pre-1.d.

**2. Claims 2.a, 9.a, 16.a: “opening a second listening software port on the initiating mobile device to receive invitation messages through the page-mode messaging service”**

116. The combination of Cordenier and Dorenbosch renders this limitation obvious. Cordenier teaches that the initiating terminal 1 may receive an invitation message (WAP Push via SMS) through the page-mode messaging service (SMS). Ex. 1007 at 7:38-53; 9:42-50. Dorenbosch teaches the implementation details of how such a WAP Push over SMS would be received and routed to the responding application, specifically, by opening a second listening software port (WDP Port). *See supra* Section X.A&B. Thus, it would have been obvious for terminal 1 to open a software listening port (WDP Port) as taught by Dorenbosch to receive the WAP Push over SMS as disclosed by Cordenier.

**3. Claims 2.b, 9.b, 16.b: “receiving, at the second listening software port and through the page-mode messaging service, a message from another mobile device inviting the initiating**

**mobile device to establish a data transfer session, wherein such message comprises a network address associated with the other mobile device”**

117. As established immediately above, in the combination of Cordenier and Dorenbosch, terminal 1 receives, at the second listening software port (WDP Port) and through the page-mode messaging service (SMS) a message from another mobile device (terminal 2 or any other Cordenier-enabled device). That SMS message invites the initiating mobile device (terminal 1) to establish a data transfer session and includes the network address of the other mobile device as established above for claim 1.b.

**4. Claims 2.c, 9.c, 16.c: “transmitting a response to the network address associated with the other mobile device, wherein the response acknowledges the ability to establish a data transfer session”**

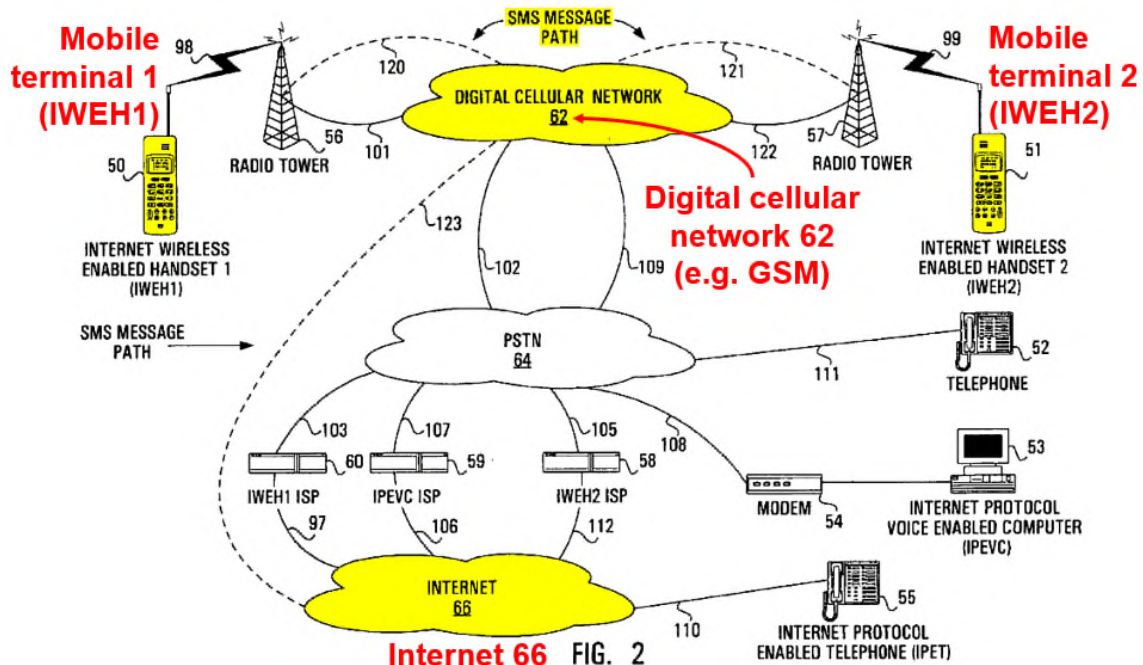
118. Cordenier discloses transmitting a response (“acknowledge message 7c”) to the network address associated with the other mobile device acknowledging the ability to establish a data transfer session. Ex. 1007 at 7:16-19, 31-37; 8:53-9:5 (“acknowledge message 7c”). Cordenier discloses that response 7c includes the IP address of the responding device (here, initiating terminal 1) for use in the session, acknowledging the ability to establish that session at that address. *Id.* at 7:54-8:2.

**XI. GROUND 5: THE COMBINATION OF LEE, RFC793, AND THE SMS SPECIFICATION RENDERS OBVIOUS CLAIMS 1, 3-8, 10-15 AND 17-20**

**A. Lee Overview**

119. Lee discloses a technique that allows an Internet Wireless Enabled Handset (IWEH1) to establish voice communications over the Internet (VoIP call) with a second Internet Wireless Enabled Handset (IWEH2). Ex. 1006 at 1:66-2:4 and 5:18-21. Lee further discloses that IWEH1 sends an SMS message to IWEH2 to set up, initiate and establish the VoIP call. *Id.* at 2:5-9 and 8:1-11. The system in Lee is shown in Figure 2, which is reproduced below.

**Lee (Ex. 1006) Figure 2 (highlighted and annotated)**

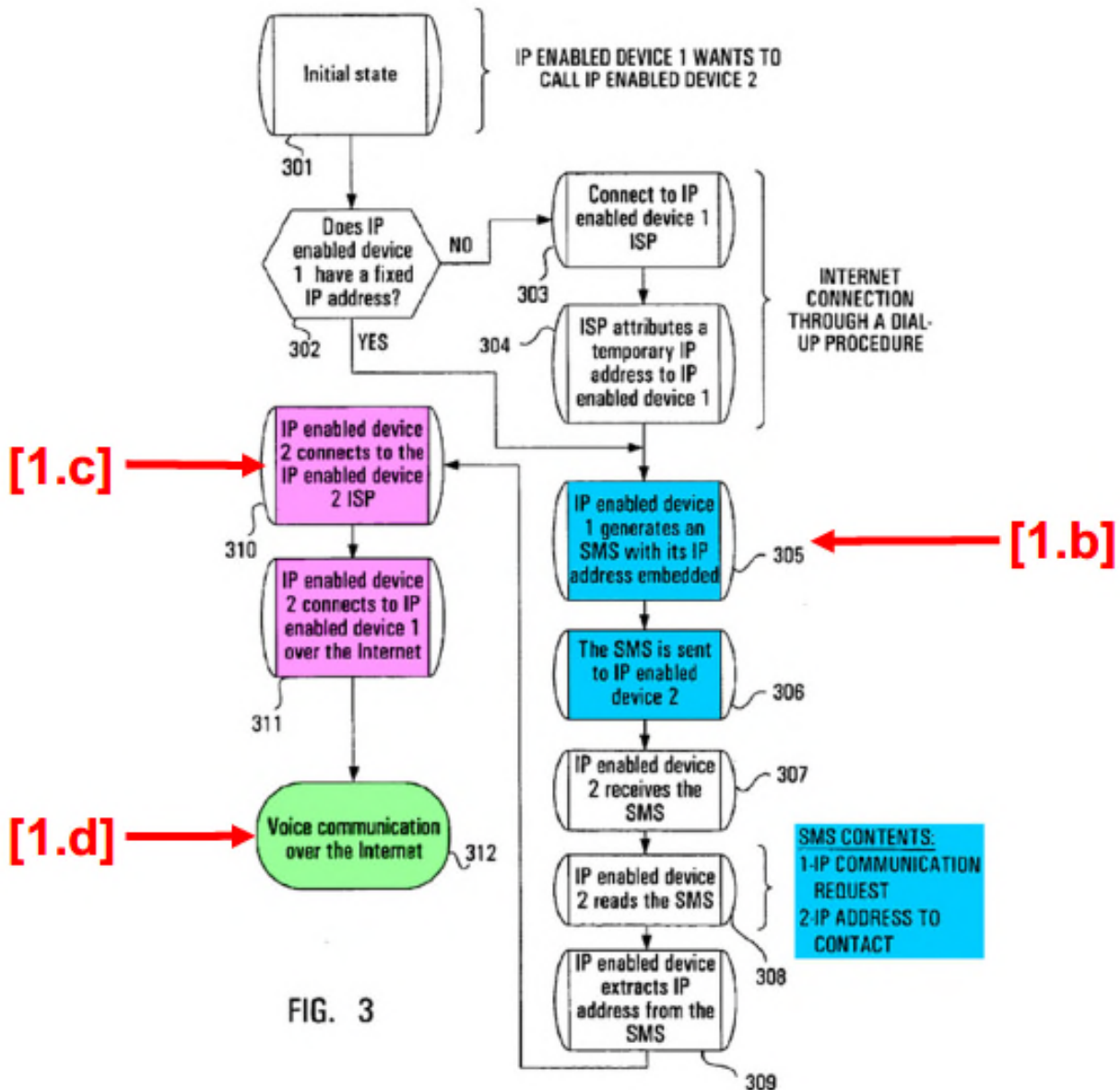


Ex. 1006 at Fig. 2.

120. Lee describes “scenario 3” for establishing a VoIP call between mobile phones IWEH1 and IWEH2, which description often incorporates aspects of scenarios 1 and 2 by reference. Ex. 1006 at Fig. 1 (steps 10, 31, 32, 33, 34, 23, 24, 25, 26 and 15), Fig. 3, 5:14-8:11; 8:12-10:13. Scenario 3 includes an SMS invite (Fig. 1(step 23), Fig. 3 (steps 305-306)), an IP-based response (Fig. 1(step 26) , Fig. 3 (steps 310-311)), and a P2P connection (Fig. (step 15), Fig. 3 (step 312)). These steps are highlighted in Figure 3 below, with annotations for the



corresponding claim steps in the 925 patent.



## B. Rationale for Combining Lee, RFC793, and the SMS Specification

121. Lee discloses that IWEH2 responds to the SMS invitation message from IWEH1 with a TCP/IP H.225 call control message to set up the requested VoIP call. Ex. 1006 at Fig. 1 (step 26), Fig. 3 (step 311), 16:61-17:4. A POSITA

would have been motivated to open a TCP software port as taught by RFC793 in order to receive and route the TCP/IP H.255 call set up message to the VoIP application as disclosed in Lee, otherwise, that response would be rejected. *See supra* Section VI.C.2; Ex. 1010 at 20, 45.

122. As explained fully below for claim 1.b, Lee discloses that the invitation message is sent via SMS but does not explicitly disclose how that SMS message is addressed. A POSITA implementing the SMS message disclosed in Lee would have been motivated to address the SMS message with the telephone number of IWEH2 as taught by the SMS Specification so that the SMS service could identify and route the SMS message to IWEH2.

### C. Detailed Claim Analysis

1. **Claim 1.pre: “A method of establishing a direct data transfer session between mobile devices that support a data packet-based communications service over a digital mobile network system, the method comprising”**

**Claim 8.pre: “A mobile device enabled to establish a direct data transfer session with other mobile devices in a digital mobile network system, the mobile device comprising a processor configured to perform the steps of”**

**Claim 15.pre: “A non-transitory computer-readable storage medium including instructions that, when executed on a processor of a mobile device that supports a data packet-based communications service over a digital mobile network system, causes the processor to establish a direct data transfer session by performing the steps of”**

123. To the extent these preambles are limiting, they are disclosed by Lee.

With respect to claim 1, Lee discloses a method of establishing a direct data transfer session (VoIP call) between mobile devices (IWEH1, IWEH2) that support a data packet-based communications service (TCP/IP), over a digital mobile network system (wireless network 62 and the Internet 66). Ex. 1006 at Figs. 1 and 2, 5:14-21, 7:57-8:11, 14:58-62. With respect to claim 8, Lee discloses a mobile device (IWEH1) enabled to establish a direct data transfer session (VoIP call) with other mobile devices (e.g., IWEH2) in a digital mobile network system (wireless network 62 and Internet 66), IWEH1&2 comprising a processor (microcontrollers 519, 520 and DSPs 505, 508). Ex. 1006 at 14:25-15:63. With respect to claim 15, Lee discloses a non-transitory computer-readable storage medium (ROMs 523,

518, 510, 507) including instructions (programs for each of the microcontrollers and DSPs) that, when executed on a processor of IWEH1, causes the processor to establish a direct data transfer session (VoIP call). Ex. 1006 at Fig. 5, 11:13-20, 11:50-51, 16:5-6; Ex. 1003 at 335-36 (admitting programs inherently contain instructions). In the alternative, it would have been obvious to a POSITA that the disclosed programs in the disclosed memories comprised the claimed instructions for the disclosed processors. Providing instructions in memory to cause the microprocessor to perform the disclosed functions is the most obvious way to implement the functionality in the hardware architecture disclosed by Lee. A POSITA would understand a program to consist of instructions and that it would be stored in a memory that could be read by the disclosed processor.

**2. Claim 1.a, 8.a, 15.a: “opening a software listening port on an initiating mobile device to receive communications through the data packet-based communications service”**

124. Lee in combination with RFC793 renders this limitation obvious. Lee discloses that IWEH1 will transmit an SMS message to IWEH2 to initiate a VoIP call, and that IWEH1 will be listening for a response from IWEH2 in the form of a TCP/IP H.225 call control message. Ex. 1006 at Fig. 1 (step 26), Fig. 3 (step 311), 5:64-66, 6:7-9, 7:56-8:11, 9:67-10:1, 14:48-15:24 (H.225 response uses TCP/IP), 15:48-63 (same), 16:61-17:1. A POSITA would therefore have found it obvious to open a software listening port on IWEH1 as taught by RFC793 to receive and

process the TCP/IP H.225 call control message as taught by Lee, as the failure to do so would result in the response being rejected. *See supra* Ex. 1010 at 20, 45; Section VI.C.2 (establishing how the RFC793 teaches that TCP ports must be opened to receive messages and applicant's admissions during prosecution that opening such ports was well known).

**3. Claim 1.b, 8.b, 15.b: “transmitting an invitation message to a target mobile device through a page-mode messaging service, wherein the invitation message comprises a network address associated with the initiating mobile device, and wherein the target mobile device is located by providing a unique identifier to the page-mode messaging service”**

125. Lee in combination with the SMS Specification renders this limitation obvious. Lee discloses the initiating mobile device (IWEH1) transmitting an invitation message (SMS message) to a target mobile device (IWEH2). Ex. 1006 at Fig. 1 (step 23), Fig. 3 (step 305-306), 5:57-61, 6:7-9, 7:16-35, 7:66-8:2 (“IP address”), 8:39-9:57 (“IP address”), 21:5-12, 22:24-26.

126. Lee discloses that the SMS message includes the network address (IP address) associated with the initiating mobile device (IWEH1). *Id.*

127. Lee discloses that the SMS service forwards the message to IWEH2 and that a POSITA would have been familiar with SMS, but does not disclose how the SMS message is addressed to accomplish that function. *Id.* at 1:25-35, 9:47-57. In implementing the SMS message disclosed in Lee, it would have been obvious to

a POSITA to address the SMS message with the telephone number of IWEH2, so that the SMS service could locate IWEH2 as taught by the SMS Specification and known in the art. Ex. 1014 at 42-43 (telephone numbers), 16 (SMS-Submit), 42-43 (defining Address Fields), 48-51 (SMS-Submit), 58 (TP-Destination-Address).

128. Additionally, while not necessary for “network address” as properly construed, it would have been obvious to a POSITA implementing Lee to expressly include a TCP port number in the SMS invitation. *See supra* Section VI.C (establishing that including a port number was a known technique, and that a POSTIA would have been motivated to include the port number in an SMS message when the port was not known in advance, to identify the responsive application, and to provide robustness and flexibility for future implementations). Lee expressly teaches that its SMS message can be adapted to include more than just the IP address. Ex. 1006 at 9:39-46.

**4. Claim 1.c, 8.c, 15.c: “receiving a response from the target mobile device at the listening software port on the initiating mobile device”**

129. Lee, in combination with the SMS Specification, renders this limitation obvious. Lee discloses initiating mobile device (IWEH1) receiving a response (TCP/IP H.225 call control message) from the target mobile device (IWEH2). Ex. 1006 at Fig. 1 (step 26), Fig. 3 (step 311), 5:64-66, 6:7-9, 7:56-8:11, 9:67-10:1, 14:48-15:24, 15:48-63, 16:61-17:1 (H.225 response). It would

have been obvious to receive the TCP/IP H.225 message taught by Lee at the listening software port (TCP port) opened on IWEH1 as taught by the SMS Specification as established above for claim 1.a.

- 5. Claim 1.d, 8.d, 15.d: “establishing a data transfer session through the data packet-based communications service between the initiating mobile device and the target mobile device, wherein the data transfer session is established in a peer-to-peer fashion without a server intermediating communications through the established data transfer session between the initiating mobile device and the target mobile device”**

130. Lee discloses establishing a data transfer session (a VoIP call including a call setup exchange using a TCP/IP session) through the data packet-based communications service (wireless network 62 and Internet 66), between the initiating mobile device (IWEH1) and the target mobile device (IWEH2). Ex. 1006 at Fig. 1 (step 15), Fig. 3 (step 312), 6:7-9, 7:57-8:11, 14:48-15:24 (H.225 and H.245 use TCP/IP), 15:48-63 (describing TCP/IP packet headers and logical channels), 16:65-17:6.

131. Lee discloses that the VoIP call uses TCP/IP sessions for the call and system control information (H.225 and H.245) which are addressed using the IP addresses for IWEH1 and IWEH2, which is precisely how the TCP/IP session is established in a peer-to-peer fashion without an intermediating server in the 925 patent. *Id.*

**6. Claims 3, 10, 17: “The [method of claim 1/mobile device of claim 8/non-transitory computer-readable storage medium of claim 15], wherein the network address of the initiating mobile device is an IP address”**

132. Lee discloses that the network address of the initiating mobile device is an IP address. *See* claim 1.b (citing, e.g., Ex. 1006 at 7:66-8:2 (“IP address”), 8:39-9:57 (same)).

**7. Claims 4, 11, 18: “The [method of claim 1/mobile device of claim 8/non-transitory computer-readable storage medium of claim 15], wherein the page-mode messaging service is SMS”**

133. Lee discloses that the page-mode messaging service is SMS. *See* claim 1.b (citing, e.g., Ex. 1006 at 7:66-8:2 (“SMS message”), 8:39-9:57 (same)).

**8. Claims 5, 12: “The [method of claim 1/mobile device of claim 8], wherein the page-mode messaging service is a PIN-to-PIN messaging service”**

134. Lee discloses that the page-mode messaging service is SMS. *See* claim 1.b (citing, e.g., Ex. 1006 at 7:66-8:2 (“SMS message”), 8:39-9:57 (same)). SMS is a species of the claimed genus of “PIN-to-PIN messaging service” as properly construed, because SMS uses the unique phone number of the target device to transmit information over the wireless network. *See, e.g.,* Ex. 1017 at [0021] (“SMS messages used by cell phones are also PIN-to-PIN messages.”)



**9. Claims 6, 13, 19: “The [method of claim 1/mobile device of claim 8/non-transitory computer-readable storage medium of claim 15], wherein the unique identifier is a telephone number”**

135. It would have been obvious to implement the SMS message disclosed in Lee by addressing the SMS message with the telephone number of IWEH2 as taught by the SMS Specification and known in the art. Ex. 1014 at 16, 42-43, 48-55, 58.

**10. Claims 7, 14, 20: “The [method of claim 1/mobile device of claim 8/non-transitory computer-readable storage medium of claim 15], wherein the data transfer session utilizes a TCP connection”**

136. Lee discloses that the data transfer session (with VoIP call setup exchange) utilizes a TCP connection for H.225 call and H.245 system information. Ex. 1006 at 14:48-15:24, 15:48-63, 16:65-17:6.

**XII. GROUND 6: THE COMBINATION OF LEE, RFC793, THE SMS SPECIFICATION AND WMA RENDERS CLAIMS 2, 9 AND 16 OBVIOUS**

**A. Rationale for Combining Lee, RFC793, the SMS Specification and WMA**

137. A POSITA would have been motivated to combine Lee, RFC793, the SMS Specification and WMA in order to use SMS ports to route the incoming SMS invitation message to the correct application. *See* Section VIII.C (establishing why a POSITA would open SMS ports as taught by the SMS Specification and WMA to receive SMS invitation messages).

## **B. Detailed Claim Analysis**

- 1. Claims 2.pre (“The method of claim 1 further comprising:”), 9.pre (“The mobile device of claim 8 wherein the processor is further configured to perform the steps of:”), 16.pre: (“The non-transitory, computer-readable storage medium of claim 15, further including instructions that cause the processor to perform the steps of:”)**

138. These dependent claims require that the initiating mobile device of claim 1 (IWEH1 in the preceding Ground) receive and respond to an invitation from another device (IWEH2 or any other Lee-enabled device). Lee discloses that IWEH1 and IWEH2 are identical. Ex. 1006 at Fig. 5, 10:4-15:63. A POSITA would understand that Lee’s disclosure of IEWH1 as the initiating device is only exemplary, and that IWEH1, the initiating mobile device for claim 1, has the identical capability to receive and respond to invitations from IWEH2 using the functionality relied on above in claim 1.pre-1.d. Thus, it would have been obvious for IWEH1 to use that disclosed capability to respond to incoming invitations.

- 2. Claims 2.a, 9.a, 16.a: “opening a second listening software port on the initiating mobile device to receive invitation messages through the page-mode messaging service”**

139. The combination of Lee, the SMS Specification and WMA renders this limitation obvious. Lee renders obvious to a POSITA that the initiating mobile device (IWEH1) can utilize the disclosed capability to receive an invitation message (SMS message) through the page-mode messaging service (SMS). *See* claim 1.b.

140. Lee does not explicitly disclose opening an SMS port to receive an SMS invitation message, but it would have been obvious to do so as taught by the SMS Specification and WMA. Lee discloses a non-standard “type field” of “IPCALLRQ” that the receiving device must recognize in order to route the VoIP call request to the responding VoIP application. Ex. 1006 at 9:33-36. A POSITA would have understood that this implementation would require modifying the SMS application to support that non-standard field. A POSITA would have known, as established above in Section VI.C.3, that standard SMS applications already support SMS ports which could perform this function. Ex. 1014 at 66-69, 72-73; Ex. 1018 at 21, 27, 30-34, 37-45. A POSITA would have been motivated to configure IWEH1 to open an SMS port in a listen mode as taught by WMA in order to receive and route incoming SMS call request messages to the responding VoIP application.

141. A POSITA implementing Lee would have been motivated to use this known technique in order to make Lee’s implementation compatible with standard SMS applications. This would maximize the deployment potential of Lee’s application in SMS phones that use standard SMS applications. Ex. 1006 at 4:45-64, 10:4-12. A POSITA would also have been motivated to use this known technique to make the SMS application and VoIP application code bases independent to assist in maintenance, debugging and upgrading of those

independent applications. Indeed, this is a major reason why ports are used to being with—to allow applications to be independent of the operating system that manages the network connections. Ex. 1010 at 12, 17-18.

**3. Claims 2.b, 9.b, 16.b: “receiving, at the second listening software port and through the page-mode messaging service, a message from another mobile device inviting the initiating mobile device to establish a data transfer session, wherein such message comprises a network address associated with the other mobile device”**

142. As established immediately above for claim 2.a, in the combination of Lee, SMS Specification and WMA, IWEH1 receives, at the second listening software port (WDP Port) and through the page-mode messaging service (SMS) a message from another mobile device (IWEH2 or any other Lee-enabled device). That SMS message invites the initiating mobile device (IWEH1) to establish a data transfer session and includes the network address of the other mobile device as established above for claim 1.b.

**4. Claims 2.c, 9.c, 16.c: “transmitting a response to the network address associated with the other mobile device, wherein the response acknowledges the ability to establish a data transfer session.”**

143. Lee discloses transmitting a response (here, IWEH 1 transmitting the H.225 TCP/IP call control and setup information for a VoIP call) to the network address associated with the other mobile device acknowledging the ability to establish a data transfer session (the VoIP call). *See* claim 1.c.

### **XIII. SECONDARY CONSIDERATIONS**

144. I am not aware of any relevant information related to secondary considerations of obviousness. For example, I am not aware of any attempt to commercialize the claimed technology in a product or through licensing. To the extent Patent Owner comes forward with any such information, I will consider it.

### **XIV. CONCLUSION**

145. I may utilize the documents cited and/or listed herein, or portions of those documents, as exhibits at any hearing or trial in this proceeding. I may further prepare and use exhibits that summarize portions of my testimony or key terms or concepts presented therein, or other demonstrative exhibits, at any hearing or trial in this proceeding.

146. I reserve the right to supplement my testimony and this report in response to any judicial determinations, in response to the arguments expressed by Uniloc or the opinions of Uniloc's experts in this proceeding, and/or in light of additional evidence or testimony brought forth at trial or otherwise brought to my attention after the date of my signature below.

147. 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. § 1004.

Henry Houh

Dr. Henry Houh

February 22, 2019

# EXHIBIT A

# Henry H. Houh

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cell: 781-325-8273

## Education

### Massachusetts Institute of Technology, Cambridge, MA

- PhD in Electrical Engineering and Computer Science, February 1998. "Designing Networks for Tomorrow's Traffic," thesis supervised by Professor David Tennenhouse and Professor John Guttag. GPA 4.7/5.0
- Master of Science in Electrical Engineering and Computer Science, February 1991. "Demonstration of a laser repetition rate multiplier," thesis. GPA 4.5/5.0
- Bachelor of Science in Electrical Engineering and Computer Science, June 1989. "Boundary element analysis of arbitrarily shaped dielectric structures," thesis. GPA 4.7/5.0
- Bachelor of Science in Physics, February 1990. GPA 4.7/5.0

## Experience

### BlocksCAD Inc. (H3XL spin-out)

- 2014 - present: Founder. BlocksCAD is a visual Computer-Aided Design (CAD) program, designed to teach children mathematics and geometric visualization. BlocksCAD is being used in U.S. schools and worldwide in maker spaces, with 350,000+ users. BlocksCAD was selected to be part of the LearnLaunch 2017 Boost Accelerator, the MIT Play Labs 2018 Summer Accelerator, and the MassChallenge 2018 Boston Cohort.

### H3XL Inc. d/b/a Einstein's Workshop (formerly Lexington Robotics)

- 2009 - present: Founder and President. Started local league providing science and engineering education programs based on LEGO Mindstorms, LEGO WeDo, and FIRST LEGO League. In 2012, grew program into a full science, technology, engineering and math enrichment program and creative/maker space, in 7,000 square feet of space. Serve 2,000+ kids and families annually. As of end of 2017, have delivered an estimated 120,000 student-instruction-hours of STEM courses. Principle Investigator for 2-year DARPA grant to improve 3D Computer Aided Design tool developed in-house for the purposes of teaching 8 year olds and up 3D CAD.

### Houh Consulting Inc. / Independent Consultant

- 2009 - present: Technical consultant specializing in Social Networking, Web 2.0, Web Site Development, Data Networking, Optical Networking, Telecommunications, Media Streaming and Voice Over IP. Representative clients include: BBN, Akin Gump Strauss Hauer & Feld LLP, Covington & Burling LLP, Winston & Strawn LLP, Wilmer Cutler Pickering Hale and Dorr LLP, Kellogg Huber Hanson Todd Evans & Figel PLLC, McGuireWoods LLP, and Sidley Austin LLP.



## **Eons**

- 2008 - 2009: Chief Technology Officer. Created product that Eons acquired from BBN Technologies. Integrated BBN product with Eons social networking platform and significantly increased the Eons group creation rate. Helped evaluate advertisement platform offerings and rolled out the “Boom Network” advertising network. Eons raised \$32 million from General Catalyst Partners, Charles River Ventures, Sequoia Capital, and Intel Capital.

## **BBN Technologies**

- 2007 - 2008: Delta Division, Vice President of Technology. Grew “Boomerang” counter-sniper project engineering team and significantly de-risked \$10 million worth of product deliveries. Boomerang was a significant asset leading to the acquisition of BBN by Raytheon in 2009. Created new business plan and grew team; launched new fully-featured social networking web site in 5 months. Served as lead expert witness in patent infringement lawsuit, resulting in \$58 million jury award to client; verdict for patents I testified on were upheld on appeal which resulted in a \$120 million settlement.
- 2004 - 2007: Delta Division, Director of Technology, responsible for commercializing IP and creating new businesses. Hired and grew division's initial engineering team. Wrote three business plans, two of which are funded and active. For call center business plan, acted as general manager, hiring and managing engineering team, inside sales team, and identifying and recruiting a new general manager. Identified and recruited other key employees to Delta Division, including senior members of team leading to successful internal sales growth and spin-outs of projects. Contracted by BBN to BBN spin-out PodZinger as VP of Operations and Technology. Identified sales team for counter-sniper system, leading to \$10 million dollars of new sales within 6 months and \$100+ million in additional orders in the following two years.

## **PodZinger Inc. (BBN spin-out, also known as EveryZing and now RAMP)**

- 2006: Vice President of Operations and Technology. Significantly upgraded capability of consumer-facing search site and redeployed web site from company to co-location facility. Identified key portions of infrastructure for upgrading and cost reduction. Helped write business plan, evaluating advertisement models of revenue. Hired in operations replacement and phased back to BBN.

## **Commonwealth Capital**

- 2004: Entrepreneur-in-residence (informally), performed technical due diligence on business plans, brainstormed ideas for new businesses with venture partner. With venture partner, left for portfolio company BBN to form core of commercialization team.

## **Empirix, Inc./Teradyne, Inc.**

- 2001 - 2004: Chief Technologist, Engineering Manager, Web Application Test Group. Researched potential new product areas; developed product plan and prototype. Responsible for three new and existing products. Managed off-shore development team. Chief architect for all web testing products. Re-architected core testing product, helped write javascript interpreter. Provided technical vision for core product.

- 2000 - 2001: Chief Technologist, Communication Infrastructure Test Group. Responsible for incorporating new technology internally, tracking new technologies, technical evaluation of partnerships and potential acquisitions. Helped develop division strategy. Developed plans which formed core capabilities for successful new products introduced in 2004-5.
- 2000 - 2001: Engineering Manager, Communications Infrastructure Test Group. Execution of new product plan developed in prior role. Grew team from four existing engineers to team of over 30 on immediate team and over 40 on project. Delivered new platform in one year. Platform and derivatives accounted for large portion of booked products for the division within 2 years and is currently (2008) a key portion of new product offerings.
- 2000: Empirix was formed as a spin-out of Teradyne in January 2000. Reported to CEO in carve-out of Empirix from Teradyne.
- 1999: (Teradyne) Director of Business Development, Software Test Units. Reported directly to Chairman of the Board/Founder and then to general manager of software test unit (6 divisions of Teradyne). Evaluated and researched acquisition and partnership candidates. Internally assessed technology position in market and gaps in product lines. Worked with senior division staff to develop new product strategies. Attended internal Teradyne divisional board meetings. Chairman served as my mentor.

### **3Com Corporation/NBX Corporation**

- 1999: Software Engineer 5. Continued work after 3Com acquisition of NBX. Built cross-division relationships for new products and research directions. NBX was acquired by 3Com in March 1999.
- 1997 - 1999: (NBX) Senior Scientist and Engineer. Work in IP Telephony. Architected next-generation product. Protocol design and validation for core protocol now used tens of millions of times daily. Led team in integration of IP protocols into current product. Designed audio reconstruction algorithms. Developed applications for bug analysis and diagnosis of system problems. Implementation of network simulator. Work on collaborative projects with external partners. Worked to identify gaps in product. Representative at numerous trade shows. Innovated novel methods of using product.

### **MIT Department of Electrical Engineering and Computer Science, Cambridge, MA**

- 1991 - 1998: Research assistant, Telemedia Network Systems Group. Design, development, and implementation of Gigabit ATM network for distributed multimedia system. Studied host interface design issues. ATM network simulation.
- Spring 1989, Fall 1990, Spring 1995: Teaching assistant, Computation Structures digital systems course. (Spring 1995 Head TA)
- 1988 - 1989: Head laboratory teaching assistant for Computation Structures. Responsibilities included writing and revising lab assignments, and maintaining the lab.
- 1987: Laboratory teaching assistant for Computation Structures.
- 1987: Design, construction, and programming of 16-bit computer.

### **Agora Technology Group, Incorporated**

- 1994 - 1996: Founder and CEO. Conceived and oversaw development of targeted advertising-supported Web sites. Responsible for company's vision and direction. Attended the first two WWW Conferences, presenting a workshop and paper at the first, and appearing on the

“Commercialization and Economics of the Web” panel and chairing the “Where Commercial Services and the Web Are Headed” panel at the second. Sold company intact; is currently an operating stand-alone company.

### **AT&T Bell Laboratories, Holmdel, NJ**

- 1989 - 1990: Implementation of cascadable all-optical fiber logic gate. Modelocking of all-fiber erbium laser. Construction of modelocked laser repetition rate booster. Strong optics laboratory and fiber optic experience.
- Summer 1988, 1987: Research in integrated optics. Analysis of rectangular waveguides using microwave modeling. Fabrication of integrated optical components.

## **Honors**

- MIT Alumni Association Great Dome Award, 2010, Baker 60<sup>th</sup> Anniversary Reunion Co-Chair (highest group award given by MIT Alumni Association)
- MIT Alumni Association Presidential Citation Award (now known as Great Dome), 2008, Member of MIT Chairman’s Salon committee
- MIT Alumni Association Bronze Beaver Award, 2007 (highest individual award given by MIT Alumni Association)
- MIT Alumni Association Volunteer Honor Roll, February 2004
- MIT Alumni Association Lobdell Award, 1999
- Boston Museum of Science Gold Pin for 1000 hours of Volunteer Service, April 1999
- MIT Alumni Association Presidential Citation Award (now known as Great Dome), 1997, Member of Alumni Online Communications Committee

## **Patents and Patent Publications**

- U.S. Patent #9,697,231, H. Houh, J. Stern, R. Spina, M. Meteer, “Methods and apparatus for providing virtual media channels based on media search,” July 4, 2017.
- U.S. Patent #9,697,230, H. Houh, J. Stern, “Methods and apparatus for dynamic presentation of advertising, factual, and informational content using enhanced metadata in search-driven media applications,” July 4, 2017. See also WO2007056485.
- U.S. Patent #7,975,296, L. Apfelbaum, H. Houh, T. Mayberry and G. Friedman, “Automated security threat testing of web pages,” July 5, 2011. See also US20030159063, WO2003067405.
- U.S. Patent #7,877,736, H. Houh and J. N. Stern, “Computer language interpretation and optimization for server testing,” January 25, 2011. See also US20050138104, WO2005043300.
- U.S. Patent #7,801,910, H. Houh and J. N. Stern, “Method and apparatus for timed tagging of media content,” September 21, 2010. See also US20070112837, US20090222442, WO2007056535.
- U.S. Patent #7,590,542, D. C. Williams, W. C. Hand, H. Houh, A. R. Seeley, “Method of Generating Test Scripts Using a Voice-Capable Markup Language,” September 15, 2009. See also EP1530869, US20030212561, WO2003096663.
- U.S. Patent #6,967,963, H. H. Houh, P. Anderson, C. Gadda, “Telecommunication method for ensuring on-time delivery of packets containing time-sensitive data,” November 22, 2005. See also EP1060400, WO2000033092, CA2318774.

- U.S. Patent #5,144,375, M. C. Gabriel, H. H. Houh, N. A. Whitaker, “Sagnac Optical Logic Gate,” September 1, 1992. Also issued as European Patent # EP0456422, July 23, 1997, German Patent #DE69126913, August 28, 1997
- U.S. Patent Application Publication No. 20020015387, “Voice Traffic Packet Capture and Analysis Tool for a Data Network” (Abandoned in 2007)
- U.S. Patent Application Publication No. 20020016708, “Method and Apparatus for Utilizing a Network Processor as Part of a Test System” (Abandoned in 2007)
- U.S. Patent Application Publication No. 20020016937, “Method and Apparatus for Utilizing a Network Processor as Part of a Test System.” (Abandoned in 2007) See also WO2002011413.
- U.S. Patent Application Publication No. 20070106646, “User-directed navigation of multimedia search results” (Abandoned in 2009)
- U.S. Patent Application Publication No. 20070106660, “Method and apparatus for using confidence scores of enhanced metadata in search-driven media applications” (Abandoned in 2009)
- U.S. Patent Application Publication No. 20070106685, “Method and apparatus for updating speech recognition databases and reindexing audio and video content using the same” (Abandoned in 2015)
- U.S. Patent Application Publication No. 20070118873, “Methods and apparatus for merging media content” (Abandoned in 2015)
- U.S. Patent Application Publication No. 20090222442, “User-directed navigation of multimedia search results” (Abandoned in 2016)
- U.S. Patent Application 11/395,732, “Search snippet creation for audio and video data” (Abandoned in 2009)
- U.S. Patent Application 11/774,931, “Methods and apparatus for managing a social networking web site”
- U.S. Patent Application 11/774,947, “Methods and apparatus for organizing media files”
- U.S. Patent Application 11/774,956, “Methods and apparatus for managing an online event”
- U.S. Provisional Patent Application 61/086,909, “Measuring and ranking relationship activity”
- U.S. Provisional Patent Application 61/086,914, “Detecting media object commonality”
- U.S. Provisional Patent Application 61/086,904, “Message categorization based on message characteristics”
- U.S. Provisional Patent Application 61/086,905, “Photo tagging to request action”

## **Trials, Testimony and Depositions**

- Case No. 1:06CV682 (CMH/BRP), Verizon vs. Vonage, U.S. District Court for the Eastern District of Virginia, filed expert report, was deposed and testified at trial.
- Case No. 1:08CV157 (CMH/TRJ), Verizon vs. Cox, U.S. District Court for the Eastern District of Virginia, was deposed and testified at trial.
- Case No. 5:09-cv-476, Two-Way Media vs. AT&T, U.S. District Court for the Western District of Texas, filed expert report, testified at trial.
- Case No. 2:10-cv-248 (RAJ/FBS), ActiveVideo Networks vs. Verizon, U.S. District Court for the Eastern District of Virginia, filed expert report and was deposed as an expert witness.
- Case No. 1:11-cv-00880-TSE-JFA, Bear Creek Technologies, Inc. vs. Verizon Services Corp., et al, U.S. District Court for the Eastern District of Virginia, was deposed as an expert witness.
- Case No. 3:10-CV-298-BBC, AlmondNet, Inc. vs. Microsoft Corp., U.S. District Court for the Western District of Wisconsin, filed expert report.

- Case No. 6:10-cv-00597, Guardian Media Technologies, Ltd. Vs. AT&T Operations, Inc. et al., U.S. District Court for the Eastern District of Texas, Tyler Division, filed expert report.
- Case No. ESCV2010-02282C, The Octopus Solution LLC v. Gary Brown et al., Essex, MA Superior Court, testified at trial.
- Investigation No. 337-TA-882, In the matter of Certain digital media devices, including televisions, Blu-ray disc players, home theater systems, tablets and mobile phones, components thereof and associated software, U.S. International Trade Commission, filed expert reports, was deposed and testified at hearing.
- Investigation No. 337-TA-995, In the matter of Certain communications or computing devices, and components thereof, U.S. International Trade Commission, filed expert reports, and was deposed.
- Case No. 8:12-cv-122-LES-TDT, Prism Technologies LLC v. AT&T Mobility LLC, U.S. District Court for the District of Nebraska, filed expert report, was deposed and testified at trial.
- Case No. 11-2684 (JWL), Sprint Communications Co., L.P., v. Comcast Cable Communications, LLC, et al., U.S. District Court for the District of Kansas, filed expert report and was deposed.
- Case No. 11-2686 (JWL), Sprint Communications Co., L.P., v. Time Warner Cable, Inc., et. al., LLC, et al., U.S. District Court for the District of Kansas, filed expert report, was deposed, and testified at trial.
- Case No. 12-487 (SLR), Cox Communications, Inc., et al., v. Sprint Communications Company L.P., et al., U.S. District Court for the District of Delaware, filed expert report and was deposed.
- Case IPR 2014-00039, Microsoft Corporation v. B.E. Technology LLC, U.S. Patent No. 6,628,314. Submitted declaration and cross-examined in deposition.
- Case IPR 2014-00086, Apple, Inc. v. Evolutionary Intelligence, LLC, U.S. Patent No. 7,010,536. Submitted declaration and cross-examined in deposition.
- Case No. 6:11-CV-421, Stragent, LLC v. Intel Corporation, U.S. District Court for the Eastern District of Texas, Tyler Division, deposed and testified at trial as a fact witness.
- IPR2014-01366, IPR2014-01367, IPR2014-01368, Samsung v. Straight Path, submitted IPR declarations and was deposed.
- IPR2015-1006, IPR2015-1007, Cisco v. Straight Path, submitted IPR declarations.
- IPR2014-01457, IPR2014-01459, Microsoft v. Biscotti, submitted IPR declaration and was deposed.
- IPR2016-00302, Apple v. Nonend, submitted IPR declaration.
- IPR2014-00812, Yelp and Twitter v. Evolutionary Intelligence, submitted IPR declaration.
- IPR2015-00307, Cisco v. AIP, submitted IPR declaration.
- Microsoft v. Acacia, submitted IPR declaration.
- IPR2015-00342, AT&T Mobility LLC and Cellco Partnership d/b/a Verizon Wireless v. Solocron, submitted IPR declaration.
- Mediatube v. Bell Canada, Canadian Federal Court, submitted expert report and testified at trial.
- CBM2016-00036, Google v. At Home Bondholder's Liquidating Trust, submitted CBM declaration.
- IPR2016-01198, IPR2016-01201, Apple, Inc. v. VoIP-Pal.com, Inc., submitted IPR declaration and was deposed.
- Case No. 3:14-cv-2824-VC, Trend Micro Incorporated v. Rpost Holdings, Inc., et al, submitted expert report and was deposed
- Akamai v. Limelight Networks, submitted IPR declarations and was deposed
- Akamai v. Limelight Networks, submitted IPR declarations
- Hyperlync Technologies v. Verizon Sourcing, No. 650151/2015 New York Supreme Court, submitted declaration and was deposed

- Cascades Streaming Technologies v. Big Ten Networks, submitted expert reports and was deposed
- Klaustech, Inc. v. Google LLC., Case No. 4:10-CV-05899-JSW (N.D. Cal.), submitted expert report and was deposed
- Cisco v. Uniloc, IPR2017-00198, IPR2017-00058, submitted IPR declarations and was deposed.
- Cisco v. Uniloc, IPR2017-00597, submitted IPR declaration and was deposed
- Twitter v. Youtoo Technologies, LLC, IPR2017-01133, IPR2017-01131, submitted IPR declarations and was deposed
- Taser International Inc. v. Digital Ally Inc., IPR2017-00375, submitted IPR declaration and was deposed
- Taser International Inc. v. Digital Ally Inc., IPR2017-00376, IPR2017-00515, IPR2017-00775, submitted IPR declarations
- HTC Corporation v. IPA Technologies, IPR2018-00306, IPR2018-00307, submitted IPR declaration
- Hulu v. Soundview, IPR2018-00864, IPR2018-01023, submitted IPR declarations and was deposed
- XpertUniverse v. Cisco, submitted declaration in support of claim construction and was deposed
- Improved Search v. Microsoft, C.A. No. 16-cv-650-JFB-SRF (Del.), submitted declaration in support of claim construction
- Apple v. Uniloc, IPR2018-00361, IPR2018-00394, IPR2018-00395, submitted IPR declarations
- LG Electronics v. Uniloc, submitted IPR declaration
- SRC Labs and Saint Regis Mohawk Tribe v. Microsoft, submitted declaration in support of claim construction and was deposed
- Verizon Wireless v. Barkan Wireless IP Holdings LP, submitted IPR declarations
- Verizon Wireless and Samsung Electronics America Inc. v. Barkan Wireless IP Holdings LP, IPR2019-199, IPR2019-200, IPR2019-234, IPR2019-631, IPR2019-632, submitted IPR declarations
- Samsung Electronics America Inc. v. Barkan Wireless IP Holdings LP, IPR2019-100, submitted IPR declaration
- Cisco Systems Inc. v. Meetrix IP LLC, IPR2019-539, IPR2019-540, IPR2019-541, IPR2019-542, IPR2019-543, IPR2019-544, submitted IPR declarations
- GMG Products LLC v. Traeger Pellet Grills LLC, PGR2019-24, submitted PGR declaration

## **Publications**

- “IP switching: server driven flow classification,” H. H. Houh, *Proceedings of the Washington University Workshop on Integration of IP and ATM*, November 1996.
- “Aurora at MIT,” D. D. Clark, H. H. Houh, and D. L. Tennenhouse, Editors, *MIT Laboratory for Computer Science Technical Report 673*, December 1995.
- “ViewStation Applications: Implications for Network Traffic,” C. J. Lindblad, D. Wetherall, W. Stasior, J. F. Adam, H. H. Houh, M. Ismert, D. Bacher, B. Phillips, and D. L. Tennenhouse, *IEEE Journal of Selected Areas in Communications*, 1995.
- “The VuNet Desk Area Network: Architecture, Implementation, and Experience,” H. H. Houh, J. F. Adam, M. Ismert, C. J. Lindblad, and D. L. Tennenhouse, *IEEE Journal of Selected Areas in Communications*, 13 (4), May, 1995.
- “Reducing the Complexity of ATM Host Interfaces,” H. H. Houh and D. L. Tennenhouse, Hot Interconnects II Symposium Proceedings, Stanford, August 11-12, 1994.

- “Media-intensive data communications in a ‘desk-area’ network,” J. F. Adam, H. H. Houh, M. Ismert, and D. L. Tennenhouse, IEEE Communications, August 1994.
- “ViewStation Applications: Intelligent Video Processing Over A Broadband Local Area Network,” C. J. Lindblad, D. J. Wetherall, W. Stasior, B. Phillips, D. Bacher, J. Adam, H. Houh, M. Ismert, and D. L. Tennenhouse, Proceedings of the 1994 USENIX Symposium on High-Speed Networking, Oakland, CA, August 1994.
- “The Media Gateway: Live Video on the World Wide Web,” H. H. Houh, C. J. Lindblad, J. Soo, D. L. Tennenhouse, and D. J. Wetherall, Workshop at the 1994 World Wide Web Conference, Geneva, Switzerland, May 1994.
- “Active Pages: Intelligent Nodes on the World Wide Web,” H. H. Houh, C. J. Lindblad, and D. J. Wetherall, Proceedings of the 1994 World Wide Web Conference, Geneva, Switzerland, May 1994.
- “Wavelength Division vs. Code Division Access Methods for Optical Networks,” H. H. Houh, Area Exam Paper, May 1993.
- “Experience with the VuNet: A Network Architecture for a Distributed Multimedia System,” J. F. Adam, H. H. Houh, D. L. Tennenhouse, Proceedings of the 18th Conference on Local Computer Networks, pp. 70-76, September 1993
- “The VudBoard: A Simple DMA Interface,” H. H. Houh, Proceedings of the 4th Gigabit Minijam, January 1994.
- “A Software-Oriented Approach to the Design of Media Processing Environments,” D. L. Tennenhouse, J. Adam, D. Carver, H. Houh, M. Ismert, C. Lindblad, W. Stasior, D. Weatherall, D. Bacher, and T. Chang., submitted to the International Conference on Multimedia Computing and Systems, May 1994.
- “A Network Architecture for Distributed Multimedia Systems,” J. F. Adam, H. H. Houh, M. Ismert, and D. L. Tennenhouse, submitted to the International Conference on Multimedia Computing and Systems, May 1994.
- “The Viewstation Collected Papers,” D. L. Tennenhouse, J. Adam, C. Compton, A. Duda, D. Gifford, H. Houh, M. Ismert, C. Lindblad, W. Stasior, R. Weiss, D. Wetherall, D. Bacher, D. Carver, and T. Chang, MIT Laboratory for Computer Science Technical Report, MIT/LCS/TR-590, November 1993.
- “A System's Perspective of the Sagnac Fiber Logic Gates and Their Possible Applications,” A. Huang, N. Whitaker, C. Gabriel, H. Avramopoulos, P. M. W. French, H. H. Houh, and I. Chuang, Applied Optics, September 10, 1994
- “Complete Switching in a Three-Terminal Sagnac Switch,” H. Avramopoulos, P. M. W. French, M. C. Gabriel, H. H. Houh, N. A. Whitaker, T. Morse, IEEE Phot. Tech. Lett. **3** (3), 235
- “Complete Switching in a Three-Terminal Sagnac Switch,” H. Avramopoulos, P. M. W. French, M. C. Gabriel, H. H. Houh, N. A. Whitaker, IEEE/LEOS Annual Meeting, Paper PDP-13, November 1990
- “All-optical phase-locked oscillator,” N. A. Whitaker, Jr., H. H. Houh, H. Avramopoulos, T. F. Morse, IEEE/LEOS Annual Meeting, Paper ELT2.4/MOO3, November 1990
- “Passive modelocking of an all-fiber erbium laser,” H. Avramopoulos, H. H. Houh, N. A. Whitaker, M. C. Gabriel, T. F. Morse, IEEE/LEOS Conference on Optical Amplifiers and their Applications, Paper PDP-8, August 1990
- “Transverse modes, waveguide dispersion, and 30ps recovery in submicron GaAs/AlAs microresonators,” J. L. Jewell, S. L. McCall, A. Scherer, H. H. Houh, N. A. Whitaker, A. C. Gossard, and J. H. English, Appl. Phys. Lett. **55** (1), July 3, 1989

## Leadership, Activities and Interests

- Leadership
  - Discovery Museums (Acton, MA)
    - Science and Technology Advisory Council, 2012 - present
  - MIT Alumni Association Board of Directors
    - K-12 STEM Initiatives Co-chair, 2013 - 2017
    - Awards Committee Chair, 2012 – 2014
    - Awards Committee, 3 year term, 2011 - 2014
    - Vice President, 2 year term, 2004 - 2006
    - Board Member, 2 year term, 1997 - 1999
  - MIT Club of Boston
    - Board of Directors, 2006 - 2011
    - K-12 Initiatives Chair, 2009 - 2012
    - VP of Communications, MIT Club of Boston, 2003 - 2006
    - Past-President, MIT Club of Boston, 2002 - 2003
    - President, MIT Club of Boston, 2001 - 2002
    - President-Elect, MIT Club of Boston, 2000 - 2001
    - VP of Programs, MIT Club of Boston, 1999 - 2000
    - Activities Super-Chair, MIT Club of Boston, 1998 - 1999
  - MIT Enterprise Forum of Cambridge, Inc.
    - Past Chair, 2009 – 2011
    - In-NOW-vation Co-chair, 2010
    - Chair, 2007 - 2009
    - Vice Chair, 2005 - 2007
    - Executive Board Member, 2002 - 2011
    - Winter Workshop Co-Chair, February 2007 - conceived idea for conference, which sold-out and produced largest attendance numbers in recent memory
    - Spring Workshop Co-Chair, Spring 2004
    - Membership Committee Chair, Fall 2003 - 2006
    - 25th Anniversary Dinner Chair, Fall 2003
    - As Membership Chair and Board Member, started Special Interest Groups in 2004; a SIG won the MIT Presidential Citation award, the MIT Alumni Association's highest award for organizations, in 2006
  - Estabrook Elementary School PTA
    - Advisory committee to the superintendent on PCB issue, 2010-2011
    - 4<sup>th</sup> Grade after-school science program co-organizer, 2010-2012
    - 4<sup>th</sup> and 5<sup>th</sup> Grade before-school Math Olympiad co-organizer, 2009-2013
    - 5<sup>th</sup> Grade BBQ and Yearbook Committee, 2011, 2013
    - Family Math Night volunteer, 2008-2012
  - Tau Beta Pi National Engineering Honor Society
    - Advisor, MA B Chapter at MIT, 2003 - present
    - District Director (National Officer), Tau Beta Pi, New England Area, 1991 - 2003
    - President, MA B Chapter at MIT, Fall 1988 - Spring 1989
    - Laureate award, 1989
  - MIT Class of 1989
    - Secretary, five consecutive 5 year terms, 1989 - 2014



- 30-year Reunion Committee, 2019
  - 25-year Reunion Committee, 2014
  - 20-year Reunion Committee and Gift Committee, 2009
  - 15-year Reunion Committee and Gift Committee, 2004
  - 10-year Reunion Committee and Gift Committee, 1999
  - 5-year Reunion Committee, 1994
  - Interim Treasurer, 1993 - 1994
  - Instituted annual senior class career fair, now raising over \$100,000 annually for senior class activities, Fall 1988
- Strong, consistent record of leadership dating to high school
- Acting
  - ‘21’ (Sony Pictures), credited as “Chinatown Dealer,” 2007, Kevin Spacey's movie about the MIT Blackjack Team inspired by “Bringing Down the House” by Ben Mezrich, opened nationwide on March 28, 2008. 21 was the number one movie in US for two weeks and number one globally for one week. 21 also topped the DVD sales, Blu-ray sales and DVD rental charts.
  - Spring Lake Theater Company, first New York-area off-broadway production of “A Chorus Line,” played role of Mark, Summer 1990
- Former member of the MIT Blackjack team
- Producer for 10,000 Maniacs’ 2013 album “Music from the Motion Picture”
- Executive Producer for 10,000 Maniacs’ 2015 album “Twice Told Tales”
- Violist, violist, harpist, guitarist, singer, actor: played in many amateur/semi-professional groups including Reading Symphony Orchestra, MIT Summer Philharmonic Orchestra, Freisinger Chamber Orchestra, Merrimack Valley Philharmonic, Longwood Symphony, MIT Symphony, and Somerville Community Chorus