

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MICROSOFT CORPORATION and AFFIRMED NETWORKS, INC.,
Petitioner,

v.

LEMKO CORPORATION,
Patent Owner.

Case IPR2023-00529
U.S. Patent No. 7,653,414

**DECLARATION OF SHAOWEI PAN IN SUPPORT OF
PATENT OWNER'S RESPONSE**

I. INTRODUCTION

I, Shaowei Pan, Ph.D., declare as follows:

1. I am over the age of majority and make this declaration of my own personal knowledge. I have personal knowledge of the facts stated herein and can testify competently to those facts. I make this declaration in support of Lemko's Patent Owner's Response.

2. In 1993, I earned my Ph.D. in Electrical Computer Engineering from the University of Wisconsin, Madison. Thereafter, I began my career as a telecommunications chip design engineer at General Instrument Corp. In 1994, I moved to Motorola Inc. as the Director of Architecture and Engineering.

3. In 2004, I joined Lemko Corporation ("Lemko") as the Chief Technology Officer ("CTO"). As the CTO, I was and continue to be responsible for overseeing Lemko's research and product development for all of its network systems and products, including those using Lemko's distributed mobile architecture ("DMA") inventions. Through my role as CTO, I am familiar with the design and operation of Lemko's DMA products and commercial deployments.

4. I am a named inventor for about 94 U.S patents, including U.S Patent No. 7,653,414 (the "'414 Patent") entitled "System, Method, and Device For Providing Communications Using a Distributed Mobile Architecture" ("DMA").

Accordingly, I am very familiar with the '414 Patent as well as Lemko's products that practice the inventions of Lemko's '414 Patent.

II. THE TECHNOLOGY LANDSCAPE AT THE TIME OF THE FILING OF THE '414 PATENT

5. At the time I filed the '414 Patent, conventional cellular networks were based on circuit-switched networks with a centralized, hierarchical architecture. In these centralized, hierarchical architectures, calls were carried from cell towers (known as a "base transceiver station" or "BTS") to regional call centers over expensive backhaul connections. Each BTS connected to a single Base Station Controller ("BSC"), which connected to a centralized mobile switching center ("MSC") that had the functionality to route calls. The BSCs connected multiple BTSs (cell sites) to an MSC through "backhaul" connections, using T1/E1 communication lines.

6. The MSCs provided the call management and routing functionality for the networks, including switching functions, call set-up, call termination, and routing. The cell towers had no functionality for managing and routing calls since that capacity was located in the centralized MSCs. Cell towers did not communicate directly with other cell towers, and BSCs did not communicate directly with other BSCs.

7. To place a call between two cell phones or other mobile devices (conventionally, “user equipment” or “UE”) on two different networks, call data was routed from (1) an originating UE, (2) to a BTS, (3) to a BSC, (4) to an MSC, (5) to the MSC for the second network, (6) to a BSC, (7) to a BTS, (8) to the receiving UE. The BTS to UE connections were wireless radio connections. The other connections in this path were circuit-switched T1/E1 connections.

8. In rural communities, the majority of phone calls are within the same community within the same BTS or adjacent BTSs. Nevertheless, every call required routing through BSCs to an MSC, which could be hundred miles away, even when the two mobile phones participating in the call were being served by the same BTS or by adjacent BTSs.

9. These centralized, hierarchical networks were hardware-based. Specifically, the MSCs were housed at large Digital Signal Processor (DSP) equipment server centers, where the MSCs relied on stacks of DSP equipment servers to handle network management. *See* Ex. 2002; Ex. 2003.

10. The centralized, hierarchical architecture, including hardware-based MSCs and BSCs and long-distance backhaul for every call, was relatively expensive. ’414 Patent at 1:34-39. Due to this high cost and the number of users required to make such a network financially viable, deployment in rural areas was often economically infeasible. ’414 Patent at 1:39-44.

III. THE '414 PATENT IS BASED ON A DISTRIBUTED CELLULAR NETWORK ARCHITECTURE (DMA)

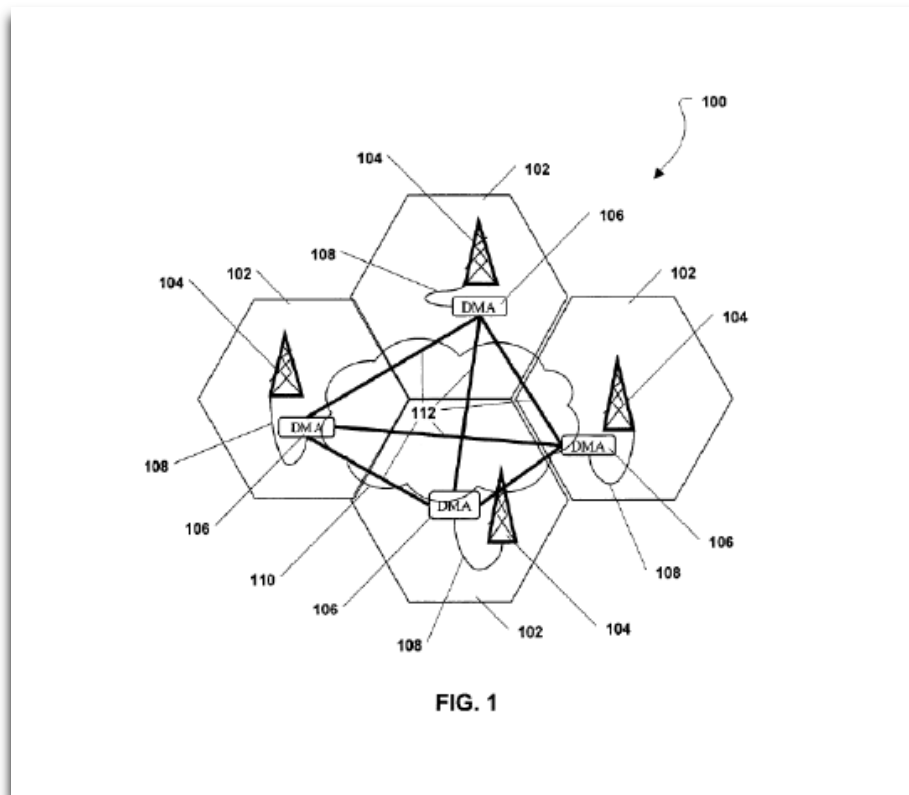
11. The '414 Patent is part of Lemko's portfolio of patents directed to distributed mobile architectures (DMAs). Lemko's "distributed mobile architecture" is a software-implemented, decentralized, peer-to-peer network solution. Using Lemko's inventions, mobile phones being served by the same or adjacent BTSs can call each other without connecting through centralized switching infrastructure and traversing lengthy backhaul. Instead of cell towers that served only as a conduit to the backhaul leading to and from regional call centers, Lemko's claimed distributed mobile architecture system removes the centralized MSCs. Ex. 2010 at 1 (The heart of DMA is an all-IP software solution that contains infrastructure for cellular service" that eliminates a "center or hub"); '414 Patent at 6:20-25 (describing that the DMA includes MSC and BSC modules), Fig. at 3.

12. As I explain below, according to the '414 Patent, each claimed distributed mobile architecture (DMA) system includes a DMA server that allows for communications to be routed locally as opposed to a centralized hub. '414 Patent at 4:28-60, Claim 1 (depicting the claimed DMA system), 7:56-59 ("A DMA system or a DMA device can include a DMA server"). In routing calls locally, the DMA systems are interconnected via peer-to-peer connections within a DMA network. '414 Patent at Claim 1.

13. **The Claimed DMA Systems:** Each DMA system has local cellular network management functionality that allows for calls to be connected without the centralized servers of a regional call center. Specifically, the DMA systems include core network functionality, such as MSC, BSC, community location register (“CLR”), and home location register (“HLR”) functionality, on software. ’414 Patent at 7:60-8:2, 5:21-6:4, 6:5-23, Fig. 3, Abstract.

14. Because the DMA systems contain their own network functionality (e.g., MSC and BSC), calls within the DMA network are routed locally amongst the DMA systems and do not need to traverse a central hub, such as an MSC.

15. **The Claimed DMA Network:** The DMA systems are connected by IP-based peer-to-peer connections to form a DMA network. See ’414 Patent at Claim 1 (reciting a “DMA network”). Figure 1 of the ’414 Patent, reproduced below, shows a distributed and associative system 100 including DMA servers 106 connected to each other via peer-to-peer connections to form the DMA network 110:



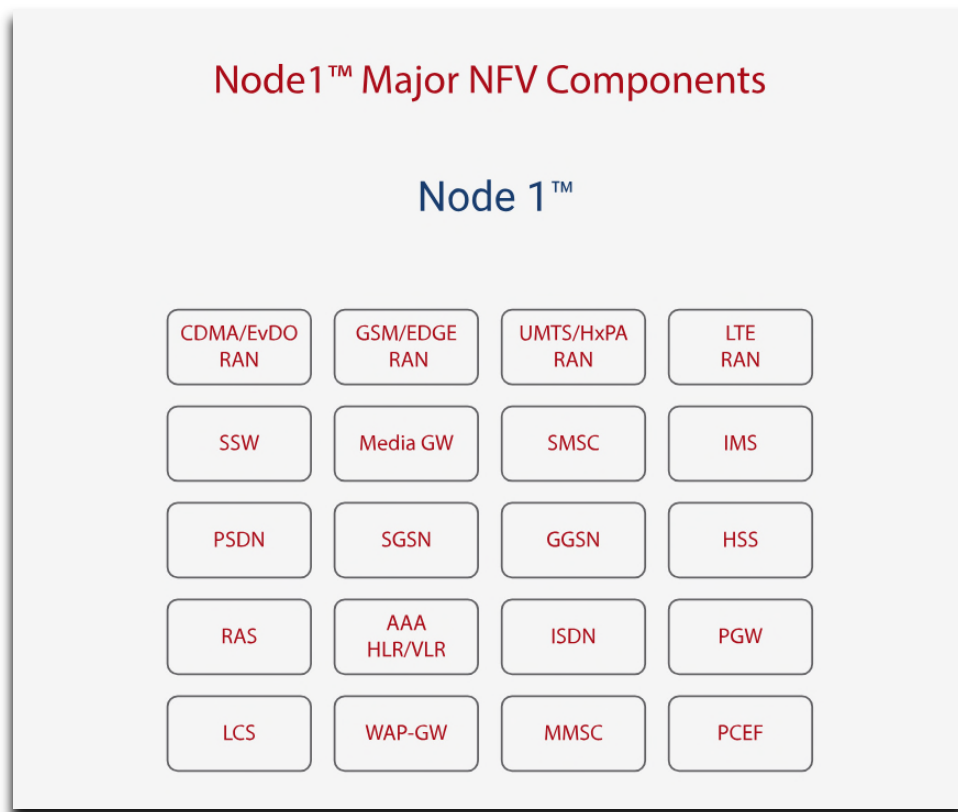
'414 Patent at Fig. 1; *id.* at 4:29-44.

16. The '414 Patent leverages the DMA network and DMA systems in multiple ways. For example, calls between two UEs that are subscribed to the same DMA Network are routed without any need to traverse expensive backhauls connections to a centralized MSC. '414 Patent at 5:37-54. If the two UEs are registered to the same DMA system, (e.g., DMA System 202), as reflected in the DMA system's Home Location Register ("HLR"), calls are routed locally via the DMA system. The HLR of each DMA system stores information about the mobile subscribers registered with that DMA system. *Id.* at 9:38-42; 10:21-23, 10:35-39.

17. If two UEs are registered to different DMA systems (e.g., DMA system 202 and 204) of the same DMA network, as reflected in the DMA systems' Community Location Registers ("CLRs"), calls are routed directly between the DMA systems. *Id.* at 5:41-54. The CLR at each DMA system stores information about mobile subscribers registered with another DMA system within the DMA network. *Id.* at 3:28-35. Each DMA system may include more than one CLR, each corresponding to the HLR of another DMA system in the DMA network. *Id.* at 8:3-29.

IV. LEMKO'S COMMERCIAL NODE1 PRODUCT PRACTICE THE '414 PATENT CLAIMS

18. Lemko's commercial Node1 product is a DMA system that practices the inventions of the Challenged Claims. Lemko's Node1, which was launched commercially in 2005, includes MSC, BSC, HLR, VLR, and CLR-controlling logic that enable the distributed mobile architecture. Lemko refers to this software-based functionality as "network function virtualization" or "NFV".



Ex. 2011 (listing modules within the Node1 product) at 2; '414 Patent at Fig. 3 (listing the same functional components running on the DMA system).

19. Through the NFV functionality, Lemko's commercial Node1 "replaces the switch (MSC) and base station controller / radio network controller (BSC/RNC) with an IP-interconnected software controlled system." Ex. 2037 at § 1.2. As described in its user manual, Lemko's Node1 product includes CLR functionality for storing information about mobile subscribers being served by other DMA systems and VLR functionality for storing information about roaming UE. Ex. 2037 at §§ 3.7-3.9 (describing Node1's CLR and VLR functionality).

20. Lemko's Node1 includes functionality for specifying a preferred hierarchy of available interfaces to make calls external to the DMA network, corresponding to the destination preference register ("DPR") limitations of the Challenged Claims. Exhibit 2038 is an example of the DPR from commercially deployed Lemko's Node1s. It shows specified routes for different types of calls.

V. LEMKO'S CLAIMED DMA SOLUTION RESOLVED A LONG-FELT INDUSTRY NEED FOR LOW COST DISTRIBUTED ARCHITECTURE

21. Lemko's claimed DMA solution, as practiced by Node1, solved the long-felt problem of providing a low-cost distributed architecture, capable of providing mobile networks in environments where the cost of conventional network architectures and backhaul was prohibitive. By at least 2000, the industry identified a need for a low-cost distributed network architecture that reduces the deployment cost associated with centralized, hierarchical architectures. Particularly, this was a problem for rural and low population density environments as the hardware implementation of centralized MSCs, BSCs, and HLR/VLR cost over \$2.0 million at that time, which made it very difficult to provide services to areas without a sufficient customer base to cover those costs. '414 Patent at 1:35-39.

22. In addition, as I discussed above, in the centralized, hierarchical architecture, call routing required expensive backhaul T1/E1 connections to centralized MSCs, even when the callers on both sides of the call were being

served by the same tower (BTS) or by nearby BTSs. This was particularly wasteful given that many calls originating in rural or remote areas are to callers also located in the same area.

23. In 2012, the industry published a whitepaper entitled “Network Functions Virtualisation” (the “NFV Paper”), which reemphasized the need to transform from a classical hardware-based approach to a network functions virtualization (NFV) approach given the drawbacks associated with the classical approach. Ex. 2008 at 3, 5 (listing cost, network service deployment, and integration and operation difficulty).

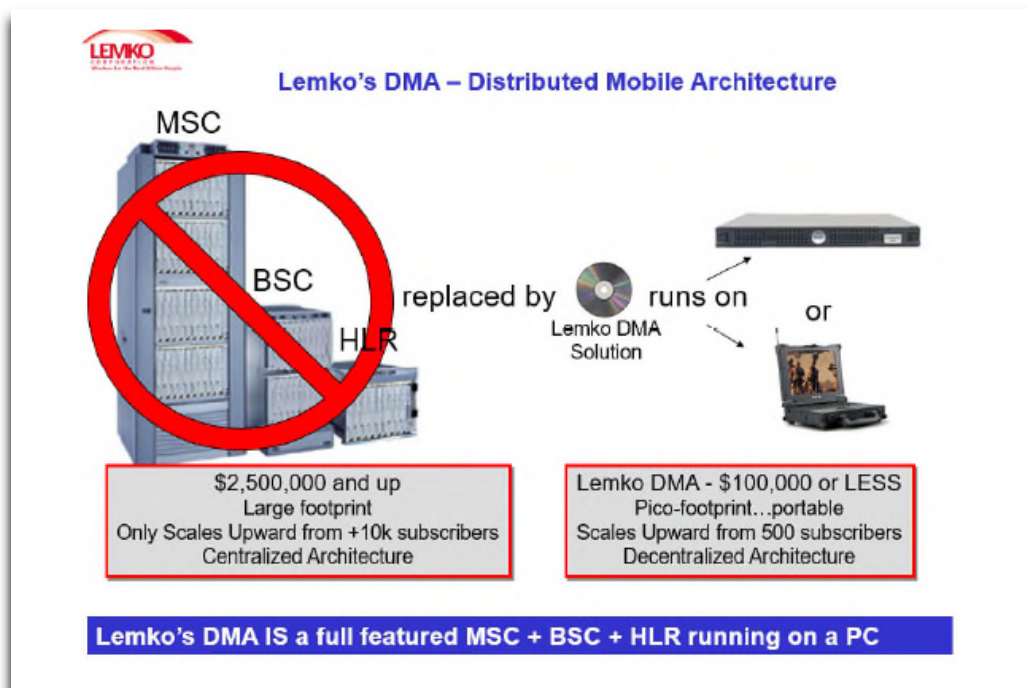
24. The NFV Paper was co-authored by representatives from major telecommunications organizations, including AT&T, BT, CenturyLink, China Mobile, Deutsche Teleko, NTT, Verizon, and others. Ex. 2008 at 1.

25. As discussed above, Lemko’s claimed DMA system, as embodied by Lemko’s commercial Node1, presents such an NFV approach. In fact, Lemko “developed Network Functions Virtualization (NFV) before that term was coined,” as its DMA systems/Node1 products included “software [that] enables all of [the] core network functions, databases and gateways.” Ex. 2009 at 1. Lemko’s commercial Node1 provided a far more cost-effective approach that scaled economically for deploying in rural areas:

Lemko Corporation is pleased to announce the first commercially available 4G Core Network Solution, Node1™. Node1 delivers the all IP, packet-switched solution defined by the industry for next generation mobile networks. The software definable network solution eliminates backhaul, meaning that Node1 provides a complete cellular network at every cell site. Lemko's Node1 eliminates backhaul by performing all switching, control, authentication and even billing record creation at each cell site.

Ex. 2039 at 1.

26. The ability of Lemko's Node1 to solve the industry need was directly tied to Lemko's distributed mobile architecture and ability to route calls locally within the DMA network by distributing CLR, HLR, and DPR data at the Node1. In this way, Lemko's Node1 solution provided a decentralized architecture that cost \$100,000 or less and economically scaled with as few as 500 subscribers.



Ex. 2001 at ¶¶ 54-55.

VI. THE INDUSTRY PRAISED LEMKO'S PATENTED DMA SOLUTION AND COMMERCIAL NODE1 PRODUCT

27. Lemko's Distributed Mobile Architecture (DMA) and commercial Node1 products have received praise from the industry and Lemko's customers and achieved commercial success in low population-density environments.

28. **AT&T's Praise of Lemko's Distributed Mobile Architecture (DMA):** AT&T, a leading telecommunications provider, praised Lemko's Node1 product and its claimed DMA solution.

29. In 2013, AT&T and Lemko had a series of meetings during which AT&T investigated Lemko's DMA solution. AT&T's Assistant Vice President and co-author of the 2012 NFV Paper, Margaret Chiosi, participated in these meetings,

which included more than 70 representatives of AT&T. After observing a demonstration of Lemko's Node1 product, Ms. Chiosi stated that Lemko had solved the problems addressed in her 2012 NFV Paper and provided Lemko with a copy of the paper.

30. In a subsequent email to Lemko, Ms. Chiosi described Lemko's Node1/DMA solution as "a radical design" that AT&T "should look at." Ex. 2008 at 1. As reflected in Lemko's contemporaneous correspondence, AT&T inquired into the distinguishing features of Lemko's technology. Ex. 2044. Lemko's "unique differentiators of [its] distributed mobile wireless network solution" included "peer-to-peer communications," "independent nodes that all act like one network," and software-based network functionality. Ex. 2044 at 1-2.

31. **TelAlaska Cellular Praised Lemko's Node1.** Lemko's customer, TelAlaska Cellular, praised Lemko's commercial Node1 product. As a provider in Alaska, TelAlaska was challenged to provide service to customers in remote regions due to the cost of conventional solutions. TelAlaska purchased Lemko's DMA network solution, powered by the Node1 products, to provide cellular coverage.

32. In a video interview, David Goggins, President of TelAlaska, described the challenges TelAlaska faced and how Lemko's Node1 solution met those challenges:

Well, due to the remoteness of our area, our primary challenge was reaching all the potential customers in the region. In the past, it was too costly to provide cellular service into these remote areas. Without an affordable means to give these consumers coverage, there was no way to provide the service.

We are a statewide full-service telecommunications provider, but our roots are in rural Alaska. We needed to find a way to provide affordable cellular service. Most of our communities are not accessible by road, so having a dependable network at each site is critical to our operation. Lemko provided the dependability and the affordability we needed to assist in providing commercial cellular service to these areas across the state of Alaska.

King Cove is a great example of the region that we've been able to expand cellular service into. It's located on the end of the Alaska peninsula over 600 miles from Anchorage. Less than a thousand people live there, so the potential market's very small. TelAlaska needed a solution that allowed us to provide wireless high-speed data, text messaging, and voice services at an affordable price. The solution also needed to let customers make local calls even when the weather blocked cellular transmission. And, lastly, it needed to be easy to maintain and upgrade remotely since travel to King Cove was expensive and weather dependent. We now provide landline and cellular services to the community. We maintain service regardless of the weather and are profitable with the Lemko solution. And most importantly, our customers enjoy the latest cellular services. Other vendors and approaches require 5 times the number of subscribers in capital,

something that just wouldn't work in a remote sparsely populated area like King Cove. Lemko was the only solution that met our business needs and challenges.

Transcription of video available at

<https://www.youtube.com/watch?v=ra9PSRXxoAg>.

33. Particularly, TelAlaska needed to “find a way to provide affordable cellular service”, that is, a “solution that allowed us to provide wireless high-speed data, text messaging, and voice services at an affordable price” to rural areas). *Id.*

34. Lemko met this challenge. In 2009, Lemko provided TeleAlaska with Lemko's Node1 mobile infrastructure as it can be deployed in remote areas given its IP software solution that “distributes the core functions of a cellular system” to provide a complete cellular network at every cite. Ex. 2049; Ex. 2045 at 2.

35. TelAlaska praised Lemko as having “the only solution that met our business needs and challenges” and allowed them to continue their “tradition of innovation and excellence in communication.” Above, ¶ 32; Ex. 2049 at 1.

36. **K-Net Praised Lemko's Node1.** Keewaywin and Round Lake First Nations were likewise faced with providing cellular services to remote regions in a cost-effective manner. They purchased Lemko's Node1 product to deploy a DMA network to deliver mobile communications to remote parts of the Northern Ontario. Ex. 2050 at 1.

37. Chief Joe Meekis stated that Lemko’s “new cellular service is bringing our community the best wireless network technology choice in 2009.” Ex. 2050 at 1; Ex. 2046 at 2 (“Lemko’s distributed architecture enabled us to upgrade the network from 2G to 3G with zero disruption to the service to the customers.”).

38. **Other Lemko Customers Similarly Praised Lemko’s Node1 Product.** Other Lemko customers, including Bristol Bay Cellular, the island of Niue, ADAK Eagle (operating in a remote island in Alaska), Globe Internet (in Malawi), Glocall Telecoms (in Mogadishu), Dryden Municipal Telephone System (Ontario), and the Republic of Kiribati purchased Lemko’s Node1 products to deploy DMA network in low-population density areas. These deployments were all successful, and these customers praised Lemko’s Node1 products, as reflected in the press releases attached hereto as exhibits. Exs. 2047-48, 2051-52.

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

40. I reserve the right to supplement my opinions in the future to respond to any arguments that Petitioner raises.

Declaration of Shaowei Pan
IPR2023-00529 (U.S. Patent No. 7,653,414)

Executed on December 21, 2023 in Schaumburg, Illinois.

A handwritten signature in black ink, appearing to read 'Shaowei Pan', written over a horizontal line.

Shaowei Pan
CTO, Lemko Corporation

CERTIFICATE OF SERVICE

The undersigned certifies, in accordance with 37 C.F.R. § 42.6(e), and pursuant to agreement by the parties that filing with the Board through the Patent Trial and Appeal Case Tracking System (P-TACTS) constitutes electronic service, that service was made on Petitioner as detailed below.

<i>Date of service</i>	December 21, 2023
<i>Manner of service</i>	Electronic Mail (mhopkins@winston.com; bshelton@winston.com; Winston-MSFT-Lemko-IPR@winston.com)
<i>Documents served</i>	DECLARATION OF SHAOWEI PAN IN SUPPORT OF PATENT OWNER'S RESPONSE
<i>Persons Served</i>	WINSTON & STRAWN LLP Matthew Hopkins Barry K. Shelton

/ James Hannah /
James Hannah (Reg. No. 56,369)
Lead Counsel for Patent Owner