

No. 2024-2336

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# United States Court of Appeals for the Federal Circuit

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LEMKO CORP.,  
*Appellant,*

v.

MICROSOFT CORPORATION, AFFIRMED NETWORKS, INC.,  
*Appellees.*

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Appeal from the United States Patent and Trademark Office,  
Patent Trial and Appeal Board, in No. IPR2023-00531.

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## **OPENING BRIEF FOR APPELLANT LEMKO CORP.**

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Paul J. Andre  
Lisa Kobialka  
James Hannah  
KRAMER LEVIN NAFTALIS  
& FRANKEL LLP  
333 Twin Dolphin Dr., Suite 700  
Redwood Shores, CA 94065  
Telephone: (650) 752-1700

Aaron Frankel  
Jeffrey Price  
Jeffrey Eng  
KRAMER LEVIN NAFTALIS  
& FRANKEL LLP  
1177 Avenue of the Americas  
New York, NY 10036  
Telephone: (212) 715-9100

***ATTORNEYS FOR LEMKO CORP.***

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**REPRESENTATIVE PATENT CLAIMS AT ISSUE**

U.S. Patent No. 7,855,988

1. A method, comprising:

receiving at a first distributed mobile architecture (DMA) gateway communications information for a communications network accessible by a second DMA gateway, the communications information indicating one or more devices accessible by one of a DMA server and a legacy communications network, wherein the first DMA gateway and the second DMA gateway participate in a DMA gateway communications network;

storing the communications information in a home DMA register of the first DMA gateway;

receiving a communication at the first DMA gateway for a target device indicated by the communications information to be served by the second DMA gateway; and

routing the communication from the first DMA gateway to the target device by relaying the communication from the first DMA gateway to the second DMA gateway via the DMA gateway communications network.

**CERTIFICATE OF INTEREST**

Counsel for Lemko Corp. certifies the following:

1. The full name of every entity represented by us is:  
  
Lemko Corp.
2. The name of the real party in interest for the entity. Do not list the real party if it is the same as the entity:  
  
Not applicable.
3. All parent corporations and any other publicly held companies that own 10 percent or more of the stock of the party or amicus curia represented by us are listed below:  
  
Not applicable.
4. The names of all law firms, and the partners or associates that have not entered an appearance in the appeal, and (a) appeared for the entity in the lower tribunal; or (b) are expected to appear for the entity in this court:  
  
None.
5. Other than the originating case number(s), any related or prior cases in this or any other court or agency that will directly affect or be directly affected by this court's decision in the pending appeal.  
  
*Lemko Corporation v. Microsoft Corporation and Affirmed Networks, Inc.*, No. 3:22-cv-00363-L-BT (N.D. Tex).
6. All information required by Fed. R. App. P. 26.1(b) and (c) in criminal cases and bankruptcy cases.

None.

Dated: January 29, 2025

By: /s/ Aaron M. Frankel

Paul J. Andre

Lisa Kobialka

James Hannah

KRAMER LEVIN NAFTALIS

& FRANKEL LLP

333 Twin Dolphin Drive, Suite 700

Redwood Shores, CA 94065

Telephone: (650) 752-1700

Facsimile: (650) 752-1800

pandre@kramerlevin.com

lkobialka@kramerlevin.com

jhannah@kramerlevin.com

Aaron M. Frankel

Jeffrey Price

Jeffrey Eng

KRAMER LEVIN NAFTALIS

& FRANKEL LLP

1177 Avenue of the Americas

New York, NY 10036

Telephone: (212) 715-9100

afrankel@kramerlevin.com

jprice@kramerlevin.com

jeng@kramerlevin.com

*Attorneys for Appellant*

Lemko Corp.

## **TABLE OF CONTENTS**

|                                                                                                                                                                                   |    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| STATEMENT OF RELATED CASES .....                                                                                                                                                  | 1  |
| JURISDICTION .....                                                                                                                                                                | 2  |
| STATEMENT OF THE ISSUES.....                                                                                                                                                      | 3  |
| INTRODUCTION .....                                                                                                                                                                | 4  |
| STATEMENT OF THE CASE AND FACTS.....                                                                                                                                              | 8  |
| I.    BACKGROUND OF THE TECHNOLOGY .....                                                                                                                                          | 8  |
| A.    Conventional Cellular Architectures Have Hierarchal,<br>Centralized Organization and Functionality .....                                                                    | 8  |
| B.    The '988 Patent Claims a Mobile Architecture Having<br>Distributed Organization and Functionality .....                                                                     | 11 |
| II.   THE <i>INTER PARTES</i> REVIEW .....                                                                                                                                        | 17 |
| A.    The Board's Construction of the "Communications<br>Information" Term Nullifies Express Claim Language.....                                                                  | 17 |
| B.    The Board did not Resolve the Parties' Dispute Over the<br>Plain Meaning of the Term "Distributed" .....                                                                    | 22 |
| SUMMARY OF THE ARGUMENT .....                                                                                                                                                     | 32 |
| ARGUMENT .....                                                                                                                                                                    | 34 |
| I.    STANDARD OF REVIEW.....                                                                                                                                                     | 34 |
| II.   THE COURT SHOULD REVERSE THE FINAL WRITTEN<br>DECISION BECAUSE FLORE UNDISPUTEDLY DOES<br>NOT DISCLOSE COMMUNICATIONS INFORMATION AS<br>THE TERM IS PROPERLY CONSTRUED..... | 35 |
| A.    The Board's Construction of the "Communications<br>Information" Term is Inconsistent with the Plain Language<br>of the Claims and the Rest of the Intrinsic Record .....    | 36 |

|      |                                                                                                                                          |    |
|------|------------------------------------------------------------------------------------------------------------------------------------------|----|
| 1.   | The Communications Information Must Identify a Device Subscribed to a Communications Network Accessible Via the Second DMA Gateway ..... | 37 |
| 2.   | The Communications Information Must Identify the Communications Network it is “For” .....                                                | 40 |
| B.   | Flore Does Not Anticipate the Claims Because the PDP Context Does Not Identify a Network Accessible by the Second Gateway .....          | 42 |
| III. | THE FINAL WRITTEN DECISION SHOULD BE REMANDED BECAUSE THE BOARD FAILED TO CONSTRUE “DISTRIBUTED” .....                                   | 46 |
| A.   | The Parties Had a Dispositive Dispute Over the Construction of “Distributed” .....                                                       | 46 |
| B.   | Remand is Necessary to Resolve the Parties’ Claim Construction Dispute .....                                                             | 50 |
|      | CONCLUSION .....                                                                                                                         | 56 |

**TABLE OF AUTHORITIES**

|                                                                                                                                  | <b>Page(s)</b> |
|----------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>Cases</b>                                                                                                                     |                |
| <i>Apple Comput., Inc. v. Articulate Sys., Inc.</i> ,<br>234 F.3d 14 (Fed. Cir. 2000) .....                                      | 39             |
| <i>Applications in Internet Time, LLC v. Salesforce, Inc.</i> ,<br>No. 2024-1133, 2024 WL 4456271 (Fed. Cir. Oct. 10, 2024)..... | 43             |
| <i>In re Applied Materials, Inc.</i> ,<br>692 F.3d 1289 (Fed. Cir. 2012) .....                                                   | 44             |
| <i>Axonics, Inc. v. Medtronic, Inc.</i> ,<br>75 F.4th 1374 (Fed. Cir. 2023) .....                                                | 49             |
| <i>CSR, PLC v. Skullcandy, Inc.</i> ,<br>594 F. App'x 672 (Fed. Cir. 2014) .....                                                 | 47             |
| <i>In re Donaldson Co.</i> ,<br>16 F.3d 1189 (Fed. Cir. 1994) .....                                                              | 35             |
| <i>Guangdong Alison Hi-Tech Co. v. Int'l Trade Comm'n</i> ,<br>936 F.3d 1353 (Fed. Cir. 2019) .....                              | 37             |
| <i>Homeland Housewares, LLC v. Whirlpool Corp.</i> ,<br>865 F.3d 1372 (Fed. Cir. 2017) .....                                     | 47             |
| <i>In re Magnum Oil Tools Int'l, Ltd.</i> ,<br>829 F.3d 1364 (Fed. Cir. 2016) .....                                              | 53             |
| <i>Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.</i> ,<br>851 F.3d 1270 (Fed. Cir. 2017) .....                            | 34             |
| <i>O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.</i> ,<br>521 F.3d 1351 (Fed. Cir. 2008) .....                              | 47, 51, 52     |
| <i>Personalized Media Commc'ns, LLC v. Apple Inc.</i> ,<br>952 F.3d 1336 (Fed. Cir. 2020) .....                                  | 34             |
| <i>Power Mosfet Techs., L.L.C. v. Siemens AG</i> ,<br>378 F.3d 1396 (Fed. Cir. 2004) .....                                       | 28             |

|                                                                                                                                                                                           |    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <i>Qualcomm Inc. v. Intel Corp.</i> ,<br>6 F.4th 1256 (Fed. Cir. 2021) .....                                                                                                              | 52 |
| <i>SAS Inst., Inc. v. ComplementSoft, LLC.</i> ,<br>825 F.3d 1341 (Fed. Cir. 2016), <i>rev'd on other grounds</i> , <i>SAS Inst., Inc. v.</i><br><i>Iancu</i> , 584 U.S. 357 (2018) ..... | 53 |
| <i>TalexMedical, LLC v. Becon Med. Ltd.</i> ,<br>No. 2021-2069, 2022 WL 2898934 (Fed. Cir. July 22, 2022) .....                                                                           | 41 |
| <i>Trintec Indus., Inc. v. Top-U.S.A. Corp.</i> ,<br>295 F.3d 1292 (Fed. Cir. 2002) .....                                                                                                 | 43 |
| <b>Other Authorities</b>                                                                                                                                                                  |    |
| 37 C.F.R. § 42.100(b) .....                                                                                                                                                               | 34 |
| U.S. Patent Trial and Appeal Board, Consolidated Trial Practice Guide<br>(Nov. 2019) .....                                                                                                | 49 |

**STATEMENT OF RELATED CASES**

Pursuant to Federal Circuit Rule 47.5, Lemko Corporation states that:

(1) no appeal other than the current appeal has been taken in or from the United States Patent and Trademark Office, Patent Trial and Appeal Board's decision in Case No. IPR2023-00531;

(2) Lemko Corporation, Microsoft Corporation, and Affirmed Networks, Inc. are parties to *Lemko Corp. v. Microsoft Corp.*, 3:22-cv-00363-L-BT (N.D. Tex.); and

(3) no other cases may directly affect or be directly affected by the Court's decision in this appeal.

## **JURISDICTION**

The Patent Trial and Appeal Board (the “Board”) issued on September 10, 2024, a Final Written Decision in IPR2023-00531 (Appx1-50, the “FWD”). Patent Owner, Lemko Corporation, timely filed a Notice of Appeal on September 16, 2024 (Appx525-528). This Court has jurisdiction over this appeal pursuant to 28 U.S.C. § 1295(a)(4)(A).

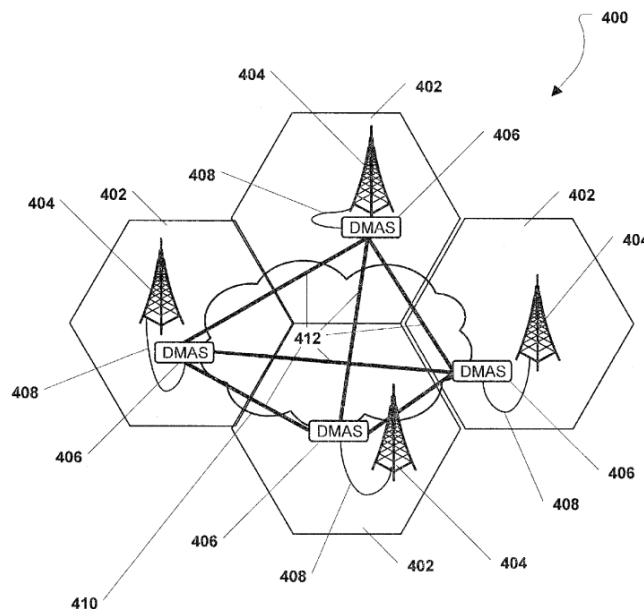
**STATEMENT OF THE ISSUES**

1. Did the Board err when it construed “communications information” contrary to the plain language of the claims, reading out several express limitations?
2. Did the Board err when it failed to resolve the parties’ dispositive dispute over the meaning of the claim term “distributed”?

## INTRODUCTION

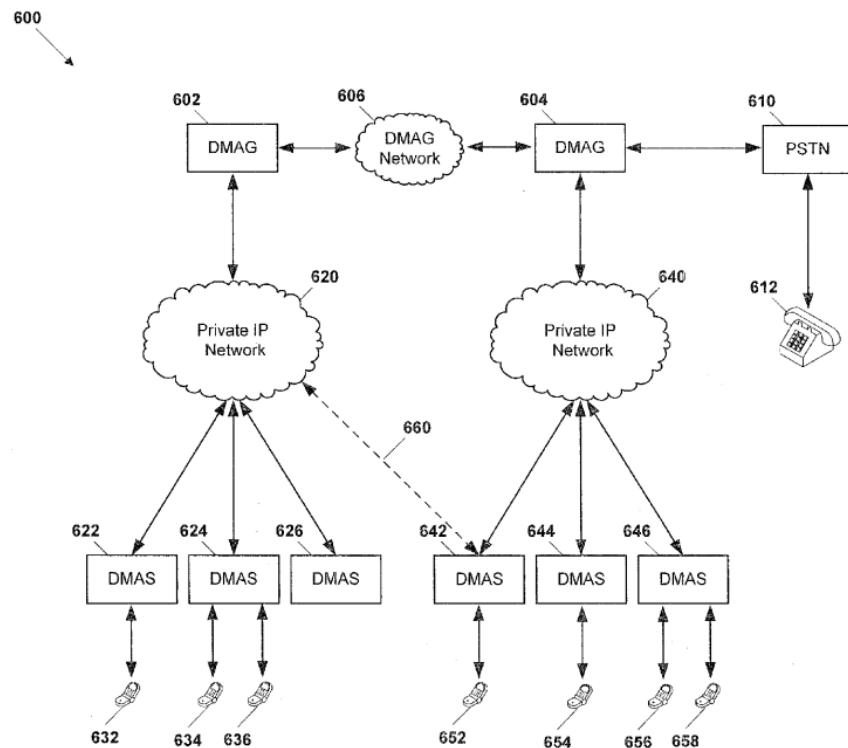
The Final Written Decision issued in IPR2023-00531 should be reversed because the Board misconstrued the key “communications information” term. At a minimum, the FWD should be vacated and remanded because the Board failed to resolve the parties’ dispositive dispute over the meaning of the term “distributed.”

Lemko’s distributed mobile architecture (“DMA”) solved a major problem that long plagued the telecommunications industry: expensive, centralized communications hubs and expensive backhaul connections to those hubs made it economically infeasible to extend cellular networks to rural areas where the small projected user base did not justify the cost of installing the necessary infrastructure. Rather than funnel all calls through a centralized hub, which requires heavy use of expensive backhaul connections, Lemko’s DMA routes calls directly between nodes of a distributed communications network, called DMA servers:



Appx65 (Ex. 1001, “’988 Patent”), Fig. 4 (showing calls directly routed between DMA servers without using backhaul to a centralized hub). All that is needed to extend the reach of an existing DMA network is a new antenna and DMA server, which are relatively easy and inexpensive to deploy as compared to connecting to a centralized hub over backhaul. Appx80 at 7:7-12 (’988 Patent).

Lemko’s ’988 Patent discloses and claims certain techniques for routing calls from one DMA network to another DMA network or to one or more existing (legacy) communications networks. In order to route calls *out* of a DMA network, each DMA network is in communication with a DMA gateway that stores communications information about the network(s) it serves and the networks that *other* DMA gateways serve.



Appx67 ('988 Patent), Fig. 6 (showing two DMA networks, 620 and 640, connected by DMA Gateways, 602 and 604). Accordingly, DMA Gateway 602 stores communications information for the network it serves (DMA network 620), **and** it receives and stores communications information for DMA network 640 and legacy network 610, which are served by DMAG 604. Appx81 at 9:36-64, 10:53-66.

Flore operates on a completely different paradigm from the inventions of the '988 Patent. Flore is about the specific problem of handing off a single mobile device as it moves from an area served by a 3G or 4G network to an area served by a different network. Flore is about managing this single-device transfer between two conventional hierarchical networks. It has no distributed architecture and does not disclose distributing communications information between DMA Gateways. In contrast, the '988 Patent and the Challenged Claims are about using specific communications information and DMA Gateways to allow a device within one network to locate and connect to a ***different device located in a different network***. The Board's determination that Flore nevertheless anticipates the '988 Patent is the result of the two claim construction errors that are the subject of this appeal.

***First***, reversal is warranted because the Board misconstrued the key "communications information" term, and Microsoft does not argue that Flore anticipates any claim under Lemko's interpretation. Its determination that communications information need not identify the communications network it is "for" is inconsistent with the plain language of the claim, the specification, and the purpose

of the invention. And its determination that the communications information need not identify devices accessible by a communications network of the *second DMA gateway* read express limitations out of the claims. Thus, the Board found anticipation despite the PDP context undisputedly not identifying the claimed communications network and Microsoft's unequivocal acknowledgment that Flore's alleged communications information (the PDP context) identifies a device that is only accessible via the *first gateway*, not the second. When the communications information limitation is correctly construed, Flore cannot anticipate the challenged claims.

*Second*, although the Board considered and rejected some of Lemko's arguments regarding the scope of the term "distributed mobile architecture," it ultimately declined to accord the term *any* express construction. The Board's non-construction of this term was in error because the parties disputed the meaning of the term distributed, and the Board invalidated the '988 Patent without resolving this dispute, despite the centrality of the meaning of the term to the FWD. Accordingly, the FWD should be vacated and remanded for the Board to resolve the parties' disputes over the meaning of the word "distributed."

## STATEMENT OF THE CASE AND FACTS

### I. BACKGROUND OF THE TECHNOLOGY

#### A. Conventional Cellular Architectures Have Hierarchical, Centralized Organization and Functionality

Conventional cellular networks depend on complex pyramids of interconnected routers, controllers, and transceivers to extend over vast areas of land. The geographical area covered by a single transceiver is called a cell. Appx805. Cells are typically depicted graphically as tiled honeycombs, but in practice there may be gaps in network coverage or coverage areas may overlap:

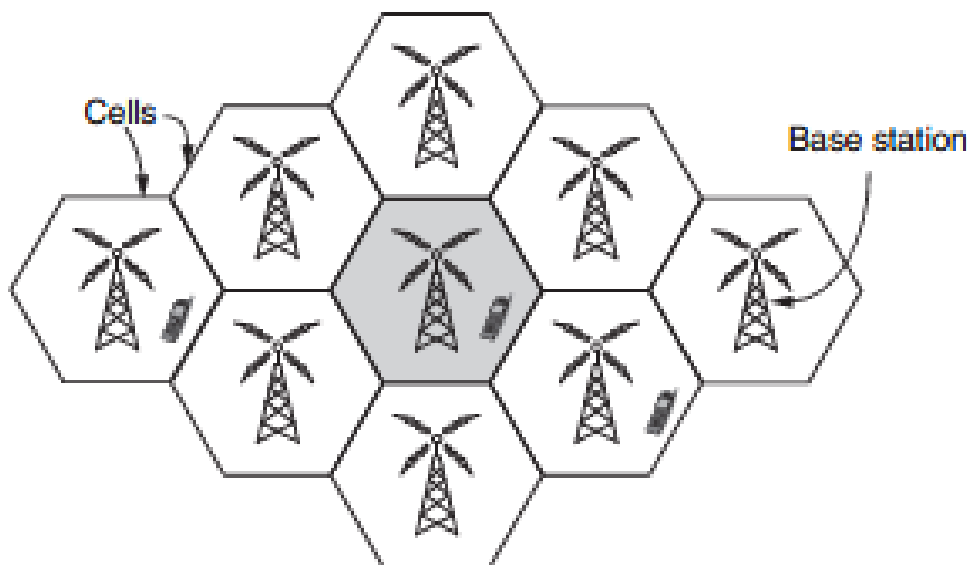
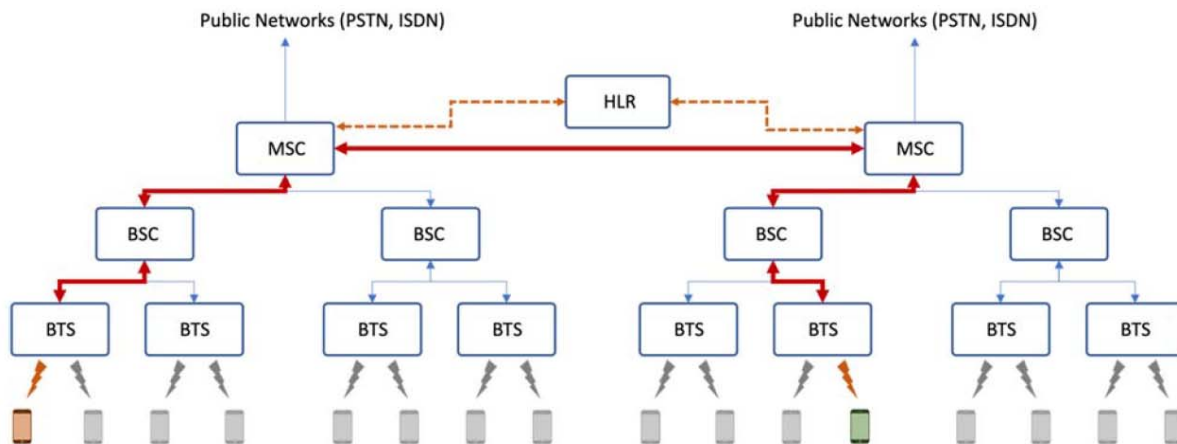


**Figure 1-30. Cellular design of mobile phone networks.**

Appx2481.

These conventional cellular networks have centralized and hierarchical architectures, which means that all calls are routed at a centralized hub, like a mobile

switching sensor (“MSC”), as shown schematically below, with the red lines showing the path for connecting two phones:



Appx1463-1464, ¶ 37 (Ex. 2021, “Cooklev Decl.”).

At the bottom level of the hierarchy, each base transceiver station (“BTS”) (often a cell phone tower) provides radio network service to mobile devices within its cell. Appx815; Appx2481; Appx1568-1569. Each BTS sends and receives calls through a base station controller (“BSC”), which manages radio resources and hands off calls as mobile devices move between cells. Appx1569-1570; Appx1315. Each BSC sends and receives calls through a centralized mobile switching center (“MSC”), which sits at the apex of the hierarchal network structure. Appx77 at 1:37-51 (’988 Patent); Appx1461-1462, ¶ 35 (Cooklev Decl.)<sup>1</sup>

<sup>1</sup> The BTS/BSC/MSC acronyms are particular to the Global System for Mobile Communications (“GSM”), or 2G, cellular communication standard. Appx1525. The Universal Mobile Telecommunications System (“UMTS”), or 3G, cellular communications standard replaces the BTS with a Node B and replaces the BSC with a Radio Network Controller (“RNC”). Appx1541-1542. The 3G standard maintains

The MSC is a centralized hub that receives and routes *all* calls, even when the caller and receiver are within the same cell. When an MSC receives a call, it consults its home location register (“HLR”) and visitor location register (“VLR”), which store location information for all mobile devices in the MSC’s service area. Appx1464, ¶ 38 (Cooklev Decl.); Appx1525-1527; Appx1573-1574. If the HLR/VLR data indicates that the intended recipient is in the MSC’s service area, it routes the call through the correct BSC and BTS to reach the recipient’s mobile device. Appx1526-1527; Appx1464, ¶ 38 (Cooklev Decl.), Appx1410. If the HLR/VLR data indicates that the intended recipient is in another MSC’s service area, such as in the example shown above, it routes the call to the proper MSC for further routing through a BSC and, ultimately, the BTS that is in radio contact with the second mobile device. Appx1410.

Such “telephone systems are expensive to deploy.” Appx77 at 1:37-44 (’988 Patent) (“[A] typical cellular system that includes a mobile switching center (MSC), a base station controller (BSC), and a home location register/visitor location register (HLR/VLR) can cost over \$2.0 million” and “may require a minimum of ten thousand users in order to be economically viable.”). For a sense of scale, this image shows a typical MSC installation:

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an MSC for traditional circuit-switched voice calls but uses a newer core network element called a Serving GPRS Support Node (“SGSN”) as a centralized hub for routing packet-switched Internet data to or from mobile devices. Appx1540.



Appx1313; Appx1465, ¶ 39 (Cooklev Decl.). “In many rural areas, the population is not large enough to support the installation of such a system.” Appx77 at 1:43-45 (’988 Patent).

**B. The ’988 Patent Claims a Mobile Architecture Having Distributed Organization and Functionality**

Lemko’s Distributed Mobile Architecture replaces this costly hierarchical network architecture with a distributed network of distributed mobile architecture servers (“DMA Servers”) that are capable of routing calls without traversing expensive backhaul connections to centralized MSCs:

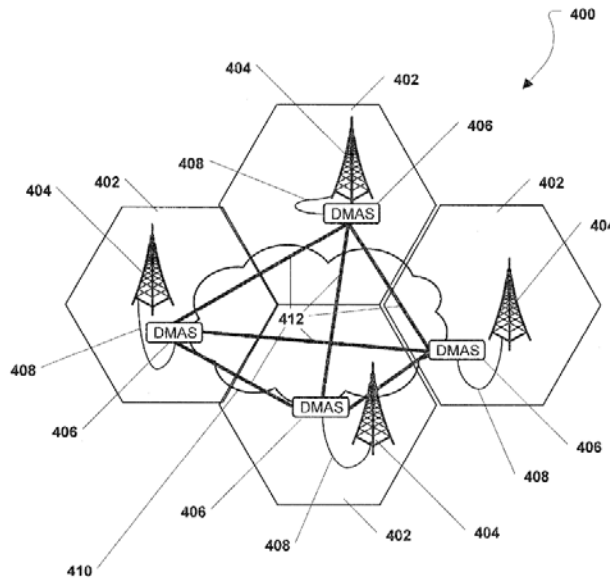
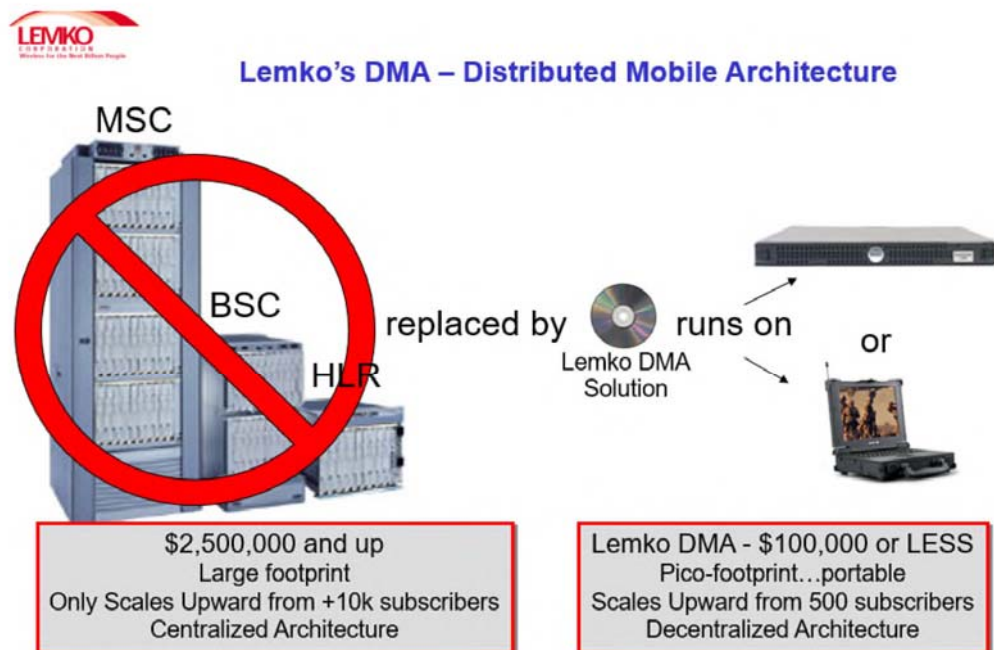


FIG. 4

Appx65, FIG. 4 ('988 Patent). Each DMA server (abbreviated DMAS in the figure above) implements MSC and BSC functionality in software on inexpensive, off-the-shelf servers, which enables localized call routing:



**Lemko's DMA IS a full featured MSC + BSC + HLR running on a PC**

Appx1265-1267, ¶ 56. This approach drastically reduces the number of users needed to economically justify an expansion of an existing DMA Network to a new location. Appx1466-1467, ¶ 42 (Cooklev Decl.) (discussing the insufficient number of users in rural areas to justify the expense of expanding infrastructure); Appx77 at 1:37-51 ('988 Patent).

Further efficiencies stream from the fact that DMA servers are connected as peers over inexpensive IP connections. As a result, calls routed between DMA servers over these IP connections are not routed over costly, fixed backhaul connections to a centralized MSC or SGSN. Instead, each DMA server in a DMA network stores the HLRs of other DMA servers in a “community location register” (“CLR”) so that any DMA server can route calls directly to any other DMA server in the network. Appx80 at 7:4-7, Appx73 at FIG. 12, Appx85 at 17:2-12, 17:50-18:8 ('988 Patent).

With call-routing functionality distributed among DMA servers, cellular network coverage can be expanded easily and inexpensively to rural and remote communities, where the cost of a backhaul connection to an MSC or SGSN is particularly burdensome. Appx77 at 1:37-2:2, Appx79 at 6:31-62, Appx80 at 7:7-12 ('988 Patent). The lack of a backhaul connection to a centralized hub, however, means that “providing a medium through which newly deployed systems can communicate with one another presents a concern.” Appx77 at 1:62-65 ('988 Patent).

To address this concern, Lemko's '988 Patent introduced the DMA Gateway, which seamlessly routes calls between devices that are not part of the same DMA

Network. Appx1471-1473, ¶¶ 50-52 (Cooklev Decl.). When a mobile device subscribed to a DMA Server calls a device served by a separate DMA Network or a “legacy” communications network, the DMA Gateway receives the call and routes it to a DMA Gateway in a DMA Gateway communications network that serves the intended recipient. Appx1472-1473, ¶ 52 (Cooklev Decl.).

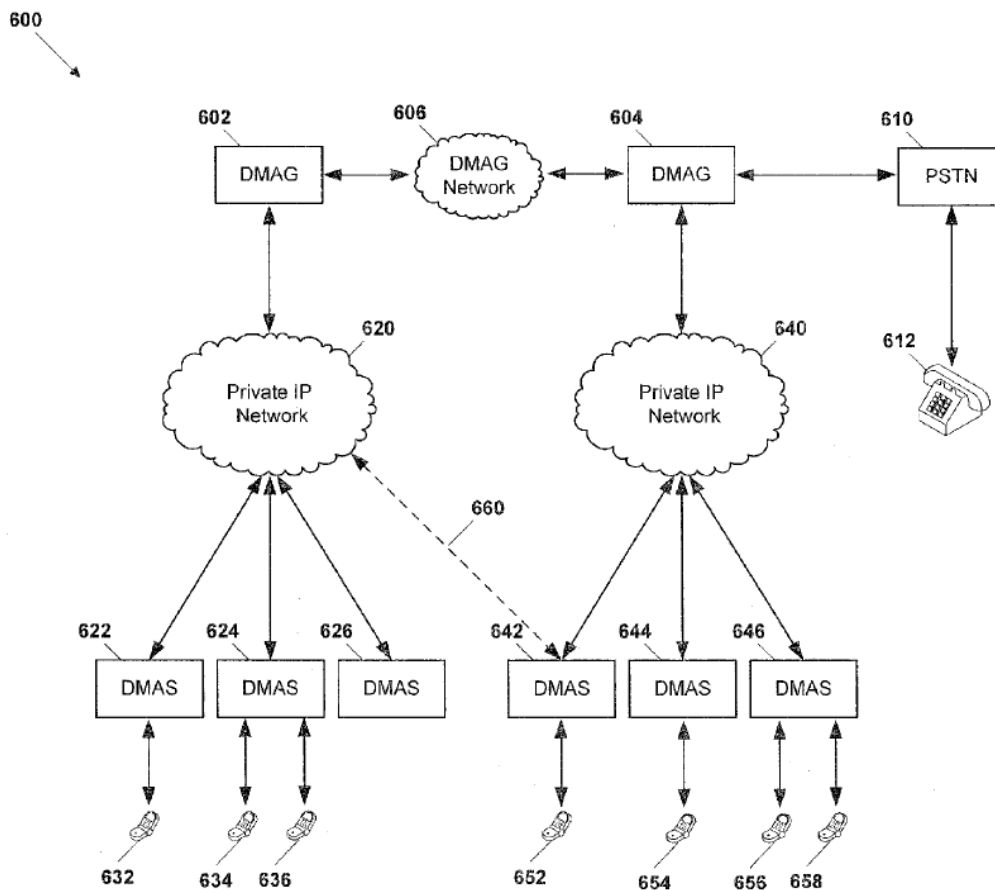


FIG. 6

Appx67, FIG. 6 ('988 Patent). For example, if mobile device 632 calls mobile device 652 or telephone 612, DMA Gateway 602 would route the call to DMA Gateway 604, which would then route the call to DMA Server 642 or PSTN network 610. Appx81-

82 at 10:42-11:9 ('988 Patent). In contrast, if mobile device 632 calls mobile device 634, which is located within the same DMA network, then DMA Server 622 will route the call to DMA Server 624 over the IP network 620. Appx81 at 10:8-19 ('988 Patent) (referencing discussion of Appx79 at 6:56-58, Fig. 4).

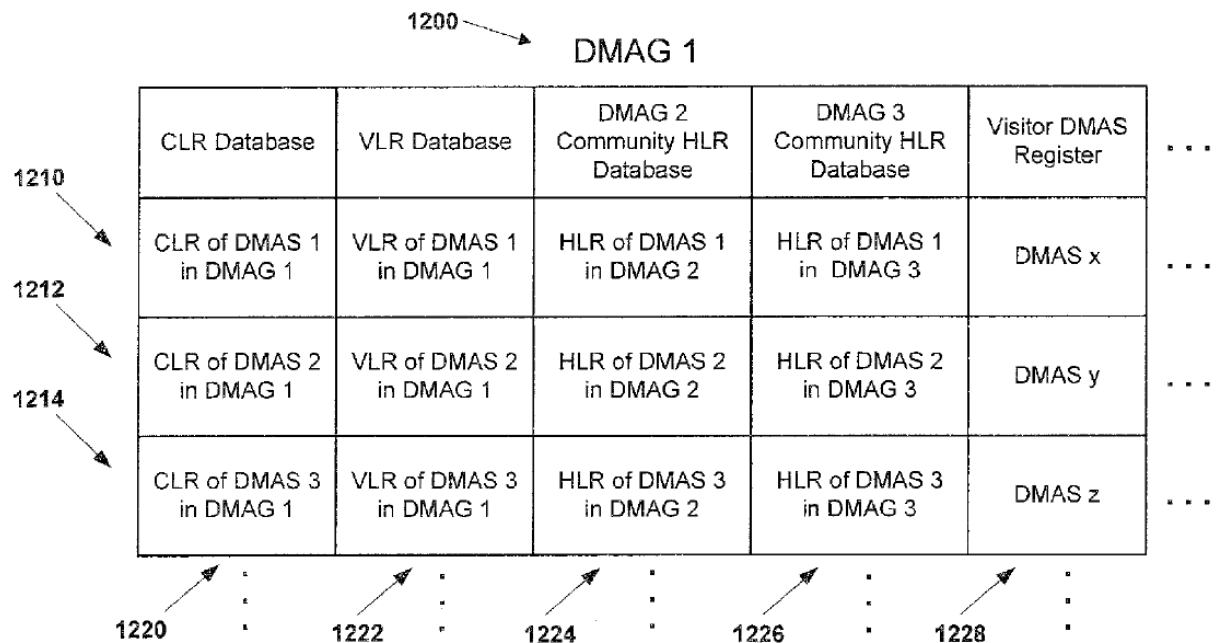
To ensure seamless routing of calls from one distributed mobile architecture network to another network, each DMA Gateway distributes information about the networks it serves to other DMA Gateways:

DMA gateways provide information to one another regarding the communications networks they service by exchanging ***register data describing the networks they service***. The register data describes devices for which the networks they service are the ***home network*** as well as for what devices are ***visiting*** on their networks.

Appx82 at 11:20-25 ('988 Patent) (emphasis added). This “communications information” is stored in a *community location register* (“CLR”) or VLR database of the DMA Gateway’s “home DMA register.” Appx85 at 17:29-31, Appx73-74 ('988 Patent); *see also* Appx1495-1496, ¶¶ 98-99 (Cooklev Decl.) (citing Appx78 at 3:4-7, Appx82 at 11:10-27, Appx84 at 15:14-28 ('988 Patent)). Each CLR stores the HLR data for the other DMA servers in the network. *Id.* These CLRs are then distributed to each DMA Gateway in a DMA Gateway network (which is different from the underlying DMA networks that connect DMA Servers) so that each DMA Gateway can route calls to devices served by other DMA Gateways as if they were served by the first DMA

Gateway. Appx106-107 (Petition); Appx82 at 11:10-12, Appx83-84 at 14:66-15:18 ('988 Patent).

As illustrated below, for example, a first DMA Gateway's register stores its own CLR and VLR (columns 1220 and 1222) along with the CLR and VLR data associated with other DMA Gateways (columns 1224 and 1226):



Appx73, FIG. 12 ('988 Patent).

In accordance with this aspect of the invention, the claims recite distributing “communications information” between DMA Gateways. Appx86 at 19:31-40, Claim 1 ('988 Patent) (reciting “receiving at a first distributed mobile architecture (DMA) gateway communications information for a communications network accessible by a second DMA gateway”). When the first DMA Gateway receives the second DMA Gateway’s “communications information,” it stores the

“communications information” in its own “home DMA register.” *Id.* Likewise, as illustrated in FIG. 12, DMA Gateway 1 receives and stores the HLRs of DMA Servers served by DMA Gateways 2 and 3 in its home DMA register. Appx73, FIG. 12 (’988 Patent).

## **II. THE *INTER PARTES* REVIEW**

Lemko filed suit in the Northern District of Texas against Microsoft and Affirmed Networks (together, “Microsoft”), asserting eight of its patents against their networking products, including the ’988 Patent. Appx853, Appx854.

Microsoft filed four petitions for IPR challenging the validity of Lemko’s patents. Two were denied institution and a third resulted in a Final Written Decision upholding the patentability of all challenged claims. *See generally* Case Nos. IPR2023-00529, IPR2023-00530, and IPR2023-00570. In this case, Microsoft asserted that U.S. Patent Pub. No. 2007/0021120 A1 to Flore (“Flore”) anticipates Claims 1, 3-9, and 20 of the ’988 Patent (the “Challenged Claims”). Appx101-102 (Petition). The Board’s misconstruction of the “communications information” term and failure to resolve the meaning of the critical “distributed” term are the two issues at the heart of this appeal.

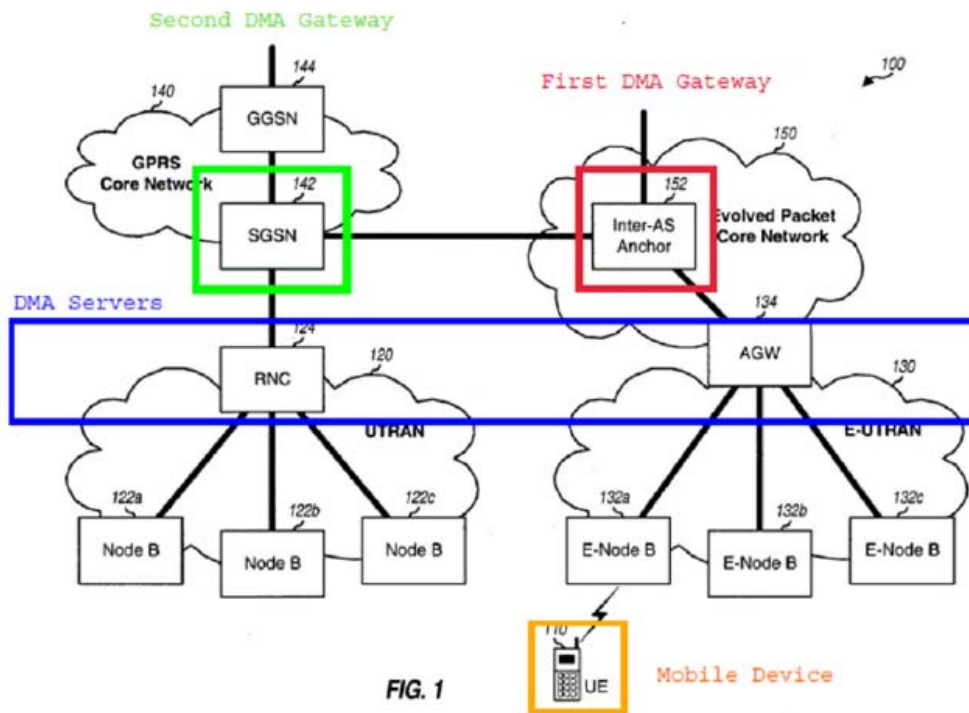
### **A. The Board’s Construction of the “Communications Information” Term Nullifies Express Claim Language**

The parties disputed the construction of “communications information.” The claims of the ’988 Patent each expressly require that communications information have these five characteristics, including that the communications information:

- (1) is “receiv[ed] at a first distributed mobile architecture (DMA) gateway,”
- (2) is “for a communications network accessible by a second DMA gateway,”
- (3) “indicat[e] one or more devices accessible by one of a DMA server and a legacy communications network,”
- (4) is “stor[ed] . . . in a home DMA register of the first DMA gateway,” and
- (5) “indicat[e]” “a target device” “served by the second DMA gateway.”

Appx86 (’988 Patent), Claim 1; Appx1493, ¶ 92 (Cooklev Decl.).

Flore does not disclose communications information that meets these five requirements. It describes a technique for handing off calls between a 3G UMTS Network and the soon-to-be-standardized 4G Evolved UTRAN (“E-UTRAN”) Network. As a mobile device moves from the service area of an eNode B (the BTS for 4G service) to the service area of a Node B (the 3G BTS), Flore’s **AGW** sends to the **Inter-AS Anchor** a “PDP context” message that identifies the **mobile device** and the **SGSN** that will serve the mobile device after the handover:



Appx111 (Petition) (annotations from Petition).

Lemko argued that this PDP context is not “communications information for a communications network accessible by a second DMA gateway.” Appx31 (emphasis omitted) (citing Appx379); *see also* Appx377-378, Appx313-314 (Patent Owner’s Response (“POR”)). Rather than contain any information identifying, about, or otherwise “for a communications **network** accessible by a second DMA Gateway,” the PDP context merely contains routing information that identifies **the SGSN 142**, which Microsoft contended was a second DMA Gateway (Appx363). Appx311-312 (POR) (citing Appx1493, ¶ 94, Appx787, ¶ 46) (emphasis added). The SGSN is the alleged DMA Gateway, not the alleged “communications network” accessible **via** the second DMA Gateway. So data identifying the second DMA Gateway is not “communications

information for a **communications network** accessible by a second DMA Gateway,” which distinguishes between the communications network and the second DMA Gateway that accesses the communications network. Appx311-12 (POR) (citing Appx1493-1494, ¶ 94 (Cooklev Decl.)).

Moreover, at the time the PDP context message is received at the alleged first DMA gateway, the mobile device (referred to in Flore as “UE”) is only accessible via a network accessed through the first DMA Gateway, as Microsoft acknowledges, and **cannot** be accessed by the second DMA Gateway, as the Challenged Claims plainly require. Appx363 (Petitioner’s Reply, “Reply”) (“[A]t the time the update PDP context message is sent, the UE is accessible by AGW, which satisfies the ‘DMA server’ language.”). Referring again to Microsoft’s annotated figure from Flore, the **mobile device** is accessible via the **Inter-AS Anchor** (the alleged **first** DMA Gateway) and the **AGW** (the alleged first DMA network) not the **SGSN** and **RNC** (the alleged **second** DMA Gateway and second DMA network. Thus, in no sense is the PDP context message communications information “for the” **RNC** accessible by the **SGSN**.

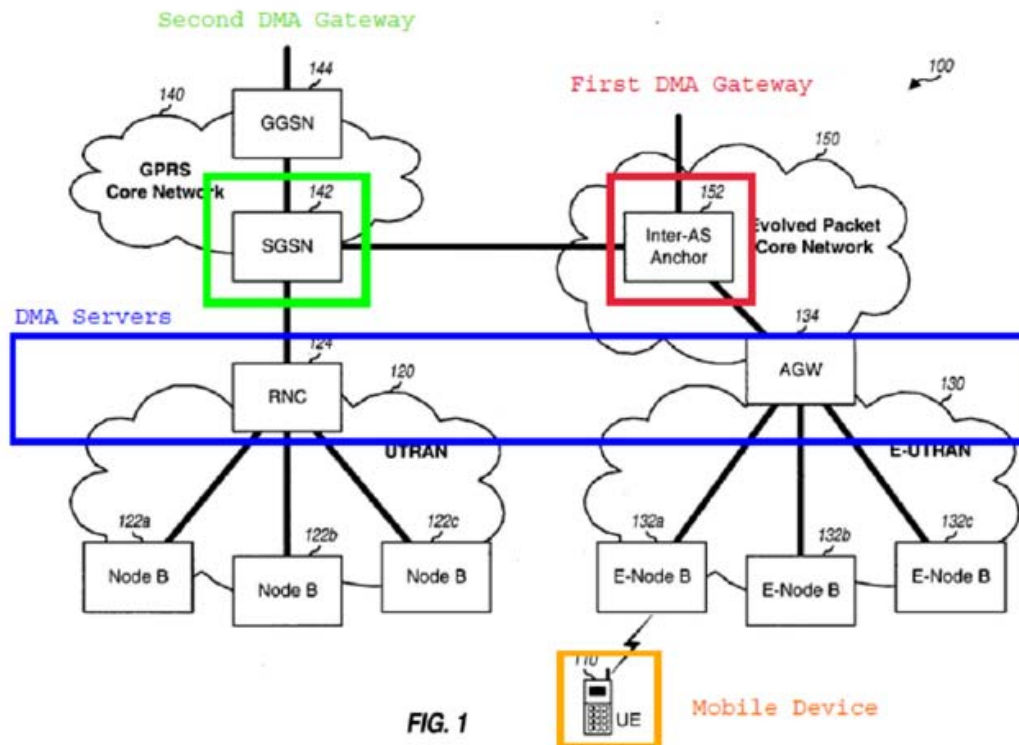


FIG. 1

Appx111 (Petition) (annotations from Petition).

In its FWD, the Board determined that “Patent Owner argues nonexistent claim limitation,” including “that the identified device must be accessible by a DMA server *via the second DMA gateway.*” Appx31 (emphasis added). But that is an express claim requirement. The Challenged Claims expressly recite that the first DMA gateway receives communications information that (1) is “for a *communications network* accessible by a second DMA gateway”—which Microsoft and the Board contend is the 3G UTRAN network accessible by the SGSN—and (2) identifies at least one device accessible by two possible *communications networks* (*i.e.* “a DMA server and a legacy communications network”):

receiving at a first distributed mobile architecture (DMA) gateway communications information for a ***communications network*** accessible by a second DMA gateway, the communications information indicating one or more devices accessible by one of ***a DMA server and a legacy communications network***,

Appx86 ('988 Patent), Claim 1 (emphasis added); Appx27, Appx29 (Board crediting Microsoft's mapping of the network "UTRAN 120 [] that includes SGSN 142" to "a communications network"). Thus, if the SGSN is the second DMA Gateway, the Challenged Claims expressly require that the communications information be data about the GPRS network beyond the SGSN. Flore's PDP context does not contain any data relating to the GPRS network. Therefore, it does not "indicat[e] one or more devices accessible by one of a DMA server and a legacy communications network" accessible by the second DMA Gateway and it cannot be "communications information for a communications network accessible by a second DMA gateway."

**B. The Board did not Resolve the Parties' Dispute Over the Plain Meaning of the Term "Distributed"**

Despite the centrality of "distributed mobile architecture" and, in particular, the meaning of the word "distributed," the Board left the term unconstrued in its Institution Decision and throughout the entirety of the IPR proceeding. "Although the phrase is used well over a hundred times in the specification and recited multiple times in each Challenged Claim," Microsoft did not construe "DMA" or "distributed" in its Petition. Appx166 (Patent Owner's Preliminary Response, "POPR"); Appx108 (Petition); *see also* Appx202-204 (Institution Decision). And while Microsoft purported

to apply the plain meaning to every term, it did not take any position on what those plain meanings might actually be, including with respect to DMA. Appx108. Instead, Microsoft contended “that for the purposes of this Petition the Board does not need to explicitly construe any claim term and there are no known claim construction disputes that affect the outcome of this Petition.” *Id.*

In its Preliminary Response, Lemko requested that the Board deny the Petition “because the Petition does not address the scope or meaning of ‘[distributed mobile architecture],’ [and] the Petition does not explain why” Flore’s conventional, hierarchical network architecture components “would fall within the scope” of the claimed distributed mobile architecture infrastructure. Appx168 (POPR) (“There is nothing ‘distributed’ about the conventional, hierarchical networks disclosed in Flore, and Petitioners do not even attempt to explain what it is about the components of these networks that make them part of a DMA network.”). Microsoft did not request leave to file a Preliminary Reply once it became clear that its claim construction position was no longer true. Appx108 (“[T]here are no known claim construction disputes that affect the outcome of this Petition.”).

The Board instituted trial without resolving the meaning of distributed mobile architecture in the context of the ’988 Patent. Appx204 (Institution Decision). Avoiding this issue altogether, the Board interpreted Lemko’s argument as a request to construe “DMA infrastructure” or “DMA network.” *Id.* It was not: Lemko used those

terms to describe Microsoft's arguments about the prior art, not to establish the scope of the Challenged Claims. Appx168 (POPR).

Given the critical importance of the distributed mobile architecture limitation to the scope of the Challenged Claims, Lemko requested Director Review. Appx240-258. Lemko explained that the distributed mobile architecture “term appears in every claim, directly or through dependency, is used to distinguish the conventional legacy networks disclosed in the prior art, and is repeated more than 800 times throughout the patent.” Appx243. Therefore, it was incumbent upon Microsoft to “propose a construction for the critical [DMA] limitation or explain how the prior art disclosed the [limitation] under any reasonable interpretation of the term.” *Id.* The Deputy Director denied the request without explanation or opinion, leaving DMA completely undefined throughout the IPR proceeding. Appx240-258; Appx52.

In its Patent Owner Response (“POR”), Lemko reaffirmed that the specification uses the term “distributed mobile architecture” consistently with the plain meaning of the term “distributed,” which requires (1) distributed functionality rather than centralized functionality and (2) distributed organization rather than hierarchal organization:

The term “distributed mobile architecture (DMA)” should be construed consistent with the plain meaning of its words and the inventor's description, which require a mobile architecture with ***distributed functionality and organization, instead of centralized functionality and hierarchal organization.***

Appx293-294 (POR) (emphasis added). To be clear, in arguing that “distributed” had a plain meaning, Lemko was not arguing that it was a nonce word or should be given no patentable weight. *Id.* Rather, Lemko argued that the word “distributed” modified “mobile architecture” and distinguished mobile architectures with centralized functionality and organization. Appx294-296.

Lemko supported this proposed construction with expert testimony evaluating the intrinsic record and extrinsic evidence. Appx293-296 (POR) (discussing the plain meaning of the term “distributed” based on intrinsic and extrinsic evidence); Appx2417 (Ex. 2030) (textbook definition of “distributed system”); Appx1477-1478, ¶ 61 (Cooklev Decl.) (citing Appx79 at 6:63-65, Appx78 at 4:1-19, Appx81-82 at 9:36-11:2). Lemko also cited press releases defining its DMA as “an architecture that allows multiple cellular nodes to be linked via IP connections” and which “communicate with each other to deliver a self-forming and self-healing network.” Appx296 (citing Appx1344 (Ex. 2010), Appx1341-1343 (Ex. 2009)). And all of this evidence was fully consistent with the way the ’988 Patent uses the term “distributed”:

Within the ***distributed*** and associative telecommunications system 400 the ***controlling logic can be distributed and de-centralized***. Moreover, the wireless coverage provided by the disclosed system 400 is ***self-healing and redundant***. In other words, due to the interconnectivity via the IP network 410, if one or more of the DMA servers 406 loses powers, fails, or is otherwise inoperable, telephony traffic handled by the inoperable DMA server 406 can re-routed to one of the remaining operable DMA servers 406. Additionally, ***user data stored in a database***, e.g., a home locator resource (HLR) or a visitor locator resource (VLR),

can be *distributed equally and fully among all of the DMA servers* 406.

Appx79-80 at 6:63-7:7 (emphasis added).

For its part, Microsoft's expert agreed that the functionality enabling wireless communications must be distributed in a DMA:

Q. What is the ordinary meaning and customary meaning of [distributed and distributed mobile architecture] in light of the specification?

A. Yes. As I said, *a mobile architecture needs to address, generally speaking, wireless communications and distributed would mean that something needs to be distributed.*

Q. What needs to be distributed?

A. *There needs to be functionality distributed.* I don't think there is a limitation defining that.

Appx1918 at 74:3-22 (Proctor Tr.) (emphasis added, objections omitted).

The Board failed to construe distributed mobile architecture and failed to identify what makes Flore's mobile architecture *distributed*, as that term is understood by a POSITA in the context of the '988 Patent. In its FWD, the Board rejected Lemko's argument that *call-routing functionality* must be distributed in a DMA. Appx13-14 (FWD) (citing Appx1918)<sup>2</sup>. However, the Board bucked the opinion of both parties' experts, who agreed that some functionality must be distributed in a DMA, and did not

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<sup>2</sup> The Board incorrectly refers to Microsoft's expert Mr. Proctor as Mr. Porter.

provide a construction identifying what functionality—if *not* call-routing functionality—must be distributed across a DMA. *Id.*

Throughout the IPR, Microsoft also did not address or dispute Lemko’s argument that a DMA must have a distributed architecture rather than a hierarchical organization. Appx348-49 (Reply); Appx386 (Patent Owner’s Sur-Reply, “Sur-Reply”) (“Petitioner fails to address, let alone rebut, the mountain of unacknowledged and unrebutted evidence and expert testimony regarding the difference between distributed and hierarchical network architectures.”) (emphasis omitted). This fundamental argument permeated Lemko’s briefing, and Microsoft left it entirely unacknowledged in its Petitioner’s Reply. *See* Appx389-390 (Sur-Reply) (“[T]he record is replete with undisputed, unrebutted evidence about what the term ‘distributed’ means in the field of communications networks, including unrebutted explanations about how distributed networks differ categorically from hierarchical ones.” (citing Appx277-283 (POR) (describing conventional hierarchical mobile communications systems))); Appx283-285.

Rather than address Lemko’s arguments about the plain meaning of the term “distributed” in the context of the ’988 Patent, Microsoft offered an alternative “plain meaning” of the term in its Reply, based solely on an off-the-cuff statement of its expert, Mr. Proctor, during cross-examination. Appx349 (Reply). According to Microsoft, distributed means “something that is part of a broader network or intended to be part of a broader network.” *Id.* (quoting Appx1969).

Microsoft did not inform the Board that Mr. Proctor immediately qualified this statement, explaining that servers in a distributed architecture must “be capable of working in such a way that it is operating with other – performing a function or sharing information or just things not singularly located.” Appx1969 at 14:11-15:4 (Ex. 2027, Proctor Tr.); *see also* Appx388-389 (Sur-Reply) (citing Appx1918 at 74:19-22 (Ex. 2026, Proctor Tr.)); Appx13 (FWD). Microsoft also did not attempt to square its alleged “plain meaning” with Mr. Proctor’s further acknowledgment that distributed architectures require ***distributed functionality***. Appx348-349 (Reply).

Nor did Microsoft explain how its nebulous definition of DMA was anything different from literally any computer network that is connected to a larger network, which removes all meaning from the critical claim limitation. Appx385 (Sur-Reply) (“Petitioners’ construction would eliminate the ‘distributed’ requirement and rewrite DMA to cover all mobile networks.”). As the Federal Circuit has held, “interpretations that render some portion of the claim language superfluous are disfavored.” *Power Mosfet Techs., L.L.C. v. Siemens AG*, 378 F.3d 1396, 1410 (Fed. Cir. 2004) (citation omitted).

Taking notice of this dispute, the Board issued a pre-hearing Order, requesting that the parties address at the Oral Hearing several dictionary definitions that the Board raised on its own initiative that neither party had submitted. Appx420-421 (Board’s Order setting oral argument); Appx2643-2644 (Ex. 3002) (dictionary entries for “distributed architecture” and “distributed processing”); Appx2647 (Ex. 3003)

(dictionary entry for “distributed processing”). Lemko argued during the hearing that these definitions, which require network nodes that share processing, support its interpretation that call-routing functionality must be distributed across the nodes of a DMA. Appx497 at 60:17-26, Appx498-499 at 61:18-62:2 (Oral Hearing Transcript); Appx2643-2644 (Ex. 3002); Appx2647 (Ex. 3003).

Lemko also pointed out that other definitions in the Board’s exhibits were fully consistent with Lemko’s interpretation of DMA and its repeated representations that a distributed mobile architecture is a specific type of “network architecture”:

**distributed computer network** *n.* A network in which all node pairs are connected either directly or through redundant paths through intermediate nodes. *See also:* decentralized computer network; centralized computer network.

Appx498 (discussing Appx2643, Appx2644 (Ex. 3002));

**distributed system.** A computer system in which several interconnected computers share the computing tasks assigned to the system.

Appx499 (discussing Appx2644 (Ex. 3002));

**distributed system** *n.* A noncentralized network consisting of numerous computers that can communicate with one another and that appear to users as parts of a single, large, accessible “storehouse” of shared hardware, software, and data.

Appx499 (discussing Appx2647 (Ex. 3003)); Appx283-289, Appx293-296 (POR); Appx385-386 (Sur-Reply).

In its FWD, the Board determined that the term “distributed” “should be accorded ... its plain and ordinary meaning,” ***but it did not explain what that plain and ordinary meaning is.*** Appx13-14. The Board did not address the experts’ express agreement that at least some functionality must be distributed across the nodes of a DMA. *Id.* It did not rely on any of the definitions from the dictionaries it raised *sua sponte*. *Id.* And it did not adopt Microsoft’s belated and unresponsive “plain meaning” of the term—any network “that is part of a broader network or intended to be part of a broader network.” Appx9 (FWD) (quoting Appx349). Thus, the Board did not explain how it understood a distributed mobile architecture to be anything more than just a generic network.

When evaluating the merits of Microsoft’s anticipation argument, the Board determined that “Figure 1 of Flore[], reproduced above, depicts, for example, separate, distributed RNC and AGW systems for communicating with a mobile device.” Appx25 (FWD). But because the Board did not expressly construe the term DMA or resolve the parties’ disagreements over the meaning of the term, it is entirely unclear what “plain meaning” of the “distributed” RNC and AGW systems allegedly satisfy, as they are not even nodes of the same network. Instead, the Board merely credited, with no analysis, for example, Mr. Proctor’s *ipse dixit* testimony that “a POSA would have understood that the RNC and AGW described in Flore serve as the ‘distributed mobile architecture (DMA) servers’ of the asserted claims.” *Id.* Neither the Board nor Mr. Proctor explained why this was the case. And neither Microsoft nor the Board contended that

Flore could anticipate the Challenged Claims under Lemko's proposed construction for DMA.

### SUMMARY OF THE ARGUMENT

1. The Board erred in concluding that Flore’s PDP context discloses the “communications information” limitations. In the ’988 Patent, each DMA Gateway shares communications information about the communications networks it serves with other DMA Gateways to ensure seamless routing of calls from one DMA network to another disjointed DMA network (or to a legacy communications network). The Board erroneously construed the term in finding that the communications information need not identify the communications information it is for or a device reachable via a communications network accessible via a second DMA gateway. Its apparent, unspoken conclusion that the claimed “DMA server” and “legacy communications network” need not be communications networks accessible via the second DMA gateway is inconsistent with the plain language of the claims and vitiates the seamless-routing purpose of the invention.

When correctly construed, Flore cannot satisfy the claimed “communications information” limitation because its PDP context undisputedly identifies a device only reachable via a communications network accessible via the alleged ***first DMA Gateway***, and there is no dispute that the device ***cannot*** be reached via the second DMA Gateway. This PDP context cannot, therefore, be communications information for a communications network accessible via a second DMA Gateway, and it does not identify a device accessible by a DMA server or legacy communications network accessible via the second DMA Gateway. Thus, applying de novo review to the

construction of communications information, the Court should reverse the FWD and find no anticipation.

2. The Board also erred by finding that Flore anticipated the '988 Patent's claims without resolving the parties' dispute over the meaning of the term "distributed." Even if the Board did not accept Lemko's proposed construction of the broader term "distributed mobile architecture," the parties offered different, case-dispositive plain meaning interpretations of the term "distributed." And, although it purported to apply the "plain meaning" of the term in its analysis, the Board never said what that plain meaning was, which essentially rendered the term meaningless. The Court should vacate and remand FWD because the Board's anticipation decision rests on deficient and inadequate claim construction findings and is, therefore, erroneous as a matter of law.

## ARGUMENT

### I. STANDARD OF REVIEW

**Claim Construction:** Both issues on appeal are subject to de novo review. This Court reviews “de novo the Board’s ultimate claim constructions and any supporting determinations based on intrinsic evidence,” while reviewing “any subsidiary factual findings involving extrinsic evidence for substantial evidence.” *Personalized Media Commc’ns, LLC v. Apple Inc.*, 952 F.3d 1336, 1339 (Fed. Cir. 2020) (citation omitted). “In an *inter partes* review proceeding, a claim of a patent . . . shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. [§] 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” 37 C.F.R. § 42.100(b). The Board’s constructions of “communications information” and “distributed” were based only on the intrinsic record, and the Board did not make any relevant subsidiary factual findings on the disputed claim construction issues. Thus, de novo review applies.

**Anticipation:** Anticipation is a question of fact reviewed for substantial evidence, and requires a showing that “each and every limitation is found either expressly or inherently in a single prior art reference.” *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 851 F.3d 1270, 1273 (Fed. Cir. 2017) (citation omitted).

Here, however, de novo review applies to the Board's conclusion of anticipation because Lemko's two appeal grounds are based on challenges to the Board's claim constructions. *In re Donaldson Co.*, 16 F.3d 1189, 1197 (Fed. Cir. 1994) (reversing a Board's invalidity decision after finding an error in the Board's claim construction and then holding "as a matter of law" that a prior art reference did not satisfy a claim limitation as properly construed, without needing to remand for further findings). The Board's factual findings that underpinned its anticipation decision were contingent on its erroneous claim construction.

**II. THE COURT SHOULD REVERSE THE FINAL WRITTEN DECISION BECAUSE FLORE UNDISPUTEDLY DOES NOT DISCLOSE COMMUNICATIONS INFORMATION AS THE TERM IS PROPERLY CONSTRUED**

Reversal is necessary because the Board incorrectly construed the "communications information" limitation. The term appears throughout the Challenged Claims and plays an important role in achieving the '988 Patent's goal of enabling DMA Gateways to manage routing to networks outside of a particular DMA network. Based on the express claim language and the specification and applying de novo review, the Court should construe the "communications information" limitations to require (1) that the one or more devices identified in the communications information be accessible via the second DMA gateway and (2) that the communications information identify the communications network it is for. The

Board's failure to do so is reversible error. When communications information is correctly construed, Flore cannot anticipate the Challenged Claims.

**A. The Board's Construction of the "Communications Information" Term is Inconsistent with the Plain Language of the Claims and the Rest of the Intrinsic Record**

The Board's determination that Flore discloses "communications information" depended entirely on reading these express limitations out of the claims. Appx27-33, Appx37-41 (FWD). Considered together, the plain language of the Challenged Claim provides several express requirements for that "communications information."

**(1) *The communications information must be received at a first DMA gateway.*** Appx86 at 19:31-32 ("receiving at a first distributed mobile architecture (DMA) gateway communications information...").

**(2) *The communications information must be for a communications network accessible by a different second DMA gateway.*** Appx86 at 19:32-33 ("communications information for a communications network accessible by a second DMA gateway").

**(3) *The communications information must indicate one or more devices accessible by one of a DMA server and a legacy communications network.*** Appx86 at 19:34-36 ("the communications information indicating one or more devices accessible by one of a DMA server and a legacy communications network").

**(4) *The communications information must be stored in a home DMA register of a DMA Gateway.*** Appx86 at 19:39-40 ("storing the communications information in a home DMA register of the first DMA gateway").

**(5) *The communications information must indicate a target device served by the second DMA Gateway.*** Appx86 at 19:42-43 ("for a target device indicated by the

communications information to be served by the second DMA gateway”).

The Board misconstrued “communications information” to not require the fifth requirement: that the communications information indicate a target device that is accessed by the **second** DMA Gateway. This was a dispositive error because Flore’s PDP context has no relationship to a target device that is accessed by the second DMA Gateway. There is no need to identify any target device in Flore, let alone one reachable by the second network because Flore is directed to the specific challenge of handing off a single mobile device that is presently connected to a first network to a different second network.

The Board’s decision should, therefore, be reversed because Flore does not disclose “communications information” meeting all of these requirements. *See* Section II.B, *infra*; *Guangdong Alison Hi-Tech Co. v. Int’l Trade Comm’n*, 936 F.3d 1353, 1363 (Fed. Cir. 2019) (“A patent claim is invalid as anticipated only if each and every element of the claim is expressly or inherently disclosed in a single prior art reference.”) (citations omitted).

**1. The Communications Information Must Identify a Device Subscribed to a Communications Network Accessible Via the Second DMA Gateway**

The Challenged Claims require that the communications information identify a device that is accessed by the network that is connected to the second DMA Gateway. This is because the purpose of the ’988 Patent is to use DMA Gateways and

communications information to allow a device in a first DMA network to find and connect to a device in a second DMA network. The Board’s determination “that the identified device [need not be] accessible by a DMA server via the second DMA gateway at the time the communications information is received” (Appx31-32 (FWD)) is inconsistent with the claims’ express requirements that the communications information identifies devices reachable by a DMA server or legacy communications network that is, in turn, “accessible by a second DMA gateway”:

receiving at a first distributed mobile architecture (DMA) gateway ***communications information*** for a communications network accessible by a second DMA gateway, ***the communications information*** indicating one or more devices accessible by one of a DMA server and a legacy communications network, wherein the first DMA gateway and the second DMA gateway participate in a DMA gateway communications network;

storing ***the communications information*** in a home DMA register of the first DMA gateway;

receiving a communication at the first DMA gateway for a target device indicated ***by the communications information*** to be served by the second DMA gateway; and

...

Appx86 at 19:31-43 (’988 Patent) (emphasis added).

This express language requires that the target device that is the subject of the communications information is reached by a network served by the second DMA Gateway, not the first DMA Gateway. The conclusion that the communications information must identify devices accessible through one of the ***second DMA***

*gateway's* communications networks is the only interpretation consistent with the core purpose of the invention. *See Apple Comput., Inc. v. Articulate Sys., Inc.*, 234 F.3d 14, 25 (Fed. Cir. 2000) (claim terms must be interpreted in light of the “purpose of the invention described”) (citations omitted). Specifically, the '988 Patent is focused on allowing devices in different DMA networks to connect to each other.

As Microsoft acknowledged in its Petition, each DMA Gateway sends communications information about its own networks to other DMA Gateways in order to allow devices located outside the network served by the specific DMA Gateway to contact devices within the networks the DMA Gateway serves:

“To facilitate communications between devices serviced by different networks, *the DMA gateways 602 and 604 maintain information identifying the devices that each services.*” Ex. 1001, 11:10-12. “When a DMA gateway detects that it is in communications range with one or more DMA servers, *the DMA gateway sends communications information from the DMA servers or other communications networks to one or more other DMA gateways* or to a central database.”

Appx106-107 (Petition) (quoting Appx82 at 11:10-12, Appx83-84 at 14:66-15:5 ('988 Patent)) (emphasis added).

Thus, the Board's conclusion that the “communications information” received at the first DMA gateway can be information about a device *currently served by the first DMA gateway* should be rejected as inconsistent both with the express language of the claims and the purpose of the invention. Each DMA Gateway *already* maintains information about the devices it serves, so it would be unreasonable to construe

“communications information for communications network accessible by a second DMA gateway” to encompass Flore’s PDP context, which is served through Flore’s alleged first DMA gateway and not its alleged second DMA Gateway, as the claims require.

## **2. The Communications Information Must Identify the Communications Network it is “For”**

The Board further erred in not construing “communications information” to require identifying the particular “communications network” that it is “for.” Appx31 (FWD). Flore’s PDP context does not contain any information about the network behind the SGSN. Appx311 (POR) (“There is nothing in a PDP context that identifies any network accessible by a second gateway.”); Appx311-312 (POR) (“No information about any networks accessible by SGSN 142 is contained in this PDP context.”); Appx380-382 (Sur-Reply) (explaining that Microsoft’s argument that the communications information need not identify the communications network it is for is inconsistent with the intrinsic record).

The Board’s conclusion that the “communications information” need not identify the “communications network” it is “for” reads express limitations out of the claims. Communications information cannot be “for” a particular communications network without identifying the network. This is confirmed by reading the claims in the context of the specification. As previously explained, the purpose of the communications information is to enable one DMA Gateway to seamlessly route calls

from a DMA server in a first network to other separate network. For this reason, the claimed “communications information” is stored in a home DMA register, which maps the identity of a communications network to the devices it serves:

DMA gateways provide information to one another regarding the communications networks they service by exchanging register data describing the networks they service. ***The register data describes devices for which the networks they service are the home network as well as for what devices are visiting on their networks.***

Appx380-381 (Sur-Reply) (citing Appx82 at 11:20-25 ('988 Patent)) (emphasis added). Microsoft recognized the very same fact in the Petition. Appx107 (Petition) (“The communications information ‘includes register information, such as home location register (HLR) information and visitor location register (VLR) information maintained by the DMA servers or other communications networks.’”) (citing Appx84 at 15:14-18 ('988 Patent)).

Instead of considering whether Microsoft’s interpretation of this limitation was inconsistent with the intrinsic record, the Board accused Lemko of importing limitations from the specification. Appx29-30 (FWD); Appx382 (Sur-Reply) (“[T]he specification explicitly contradicts Petitioners’ unsupported assertion that the ‘communications information for a communications network’ need not identify the communications network.”). The Board’s failure to consider whether the specification is consistent with the construction that the communications information need not identify the communications network it is for is itself cause for vacatur. *See TallexMedical,*

*LLC v. Becon Med. Ltd.*, No. 2021-2069, 2022 WL 2898934, at \*6 (Fed. Cir. July 22, 2022) (finding error in Board’s claim construction where the Board “failed to consider the possibility that [its construction is] inconsistent with the intrinsic evidence”).

**B. Flore Does Not Anticipate the Claims Because the PDP Context Does Not Identify a Network Accessible by the Second Gateway**

The FWD must be reversed because Flore undisputedly fails to teach communications information that identifies (1) devices accessible via a communications network of the second DMA Gateway and (2) the communications network it is for.

Flore discloses handing off a single mobile device from one network to another. To do so, Flore discloses exchanging “PDP context” messages when a cell phone is handed off from one network to another. Appx113 (Petition); Appx787 at [0046] (sending the PDP context before step 11); Appx1494, ¶¶ 95-96 (Cooklev Decl.). The format, protocol, and technical characteristics of PDP context messages are known in the art and are undisputed by the parties. Among the undisputed facts about the PDP context is that it does not identify a user device accessible via the SGSN, which Microsoft alleges to be the second DMA Gateway, nor does the PDP context identify any network that is accessed via the SGSN. Appx363 (Reply) (“[A]t the time the update PDP context message is sent, the UE is accessible by AGW, which satisfies the ‘DMA server’ language.”). There would be no need for the PDP context message to do so because all the Inter AS Anchor does it forward traffic to the SGSN, which—like all centralized hubs—is responsible for routing all calls in and out of the networks it serves.

Whether or not AGW is a DMA Server (Lemko maintains that it is not), the AGW is only accessible via the first DMA Gateway, not the second.

Accordingly, if the Challenged Claims are construed according to their plain language, Flore's PDP context cannot be the claimed "communications information" because it identifies a device that is only accessible via a network that is accessible via the (alleged) first DMA Gateway, not the second DMA Gateway, as the claims require. *See* Section II.A.1, *supra*. Thus, the Board's determination that Flore discloses the "communications information" element is premised on its misconstruction of the term as covering data identifying a device accessible by the first network, not the second DMA Gateway. Appx32-33 (FWD); *Applications in Internet Time, LLC v. Salesforce, Inc.*, No. 2024-1133, 2024 WL 4456271, at \*6 (Fed. Cir. Oct. 10, 2024) (non-precedential) ("[T]he anticipation inquiry is a search for strict, not substantial, identity.") (citing *Trintec Indus., Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292, 1296 (Fed. Cir. 2002)).

Further, whereas the communications information must identify the communications network it is for, Flore's alleged "first DMA gateway" (the Inter A/S Anchor) only receives communications information for the alleged **second DMA Gateway** (the SGSN). Even if the SGSN is considered the second DMA Gateway, it is not a **communications network** accessible by a second gateway. Appx1493-1494, ¶ 94 (Cooklev Decl.). Here, Microsoft contends that UTRAN 120, not the SGSN, is the communications network accessible by a second DMA gateway. Appx112-113

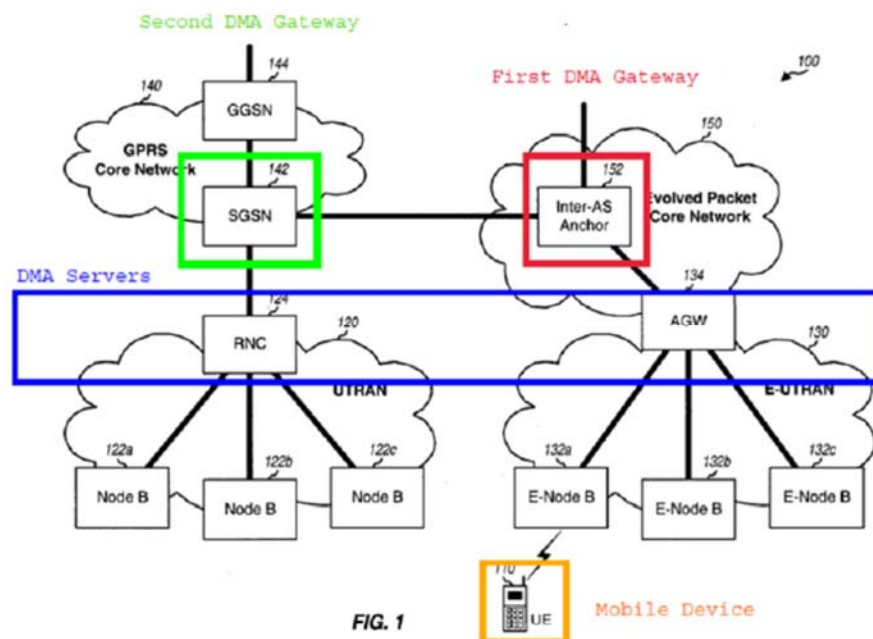
(Petition); Appx362 (Reply) (expressly paraphrasing “a communications network” as “[UTRAN 120]”).

There is no need for the PDP context message to contain the required communications information because its function is to facilitate the handover of one device from a first network to another network, not to enable one phone in a first network to locate and connect to another phone via a different network. For this reason, a PDP context message contains various parameters used to hand over the mobile device, such as routing information for IP packets, but the record evidence shows there is nothing in the PDP context message that identifies any network accessible by a second DMA Gateway. At most, the record evidence showed that a PDP context message identifies what Microsoft contends is the second DMA gateway (SGSN 142), so that when a mobile phone moves from a 4G-enabled cell site to a 3G cell site, “future packets for the [mobile phone] are forwarded to SGSN 142 instead of AGW 134.” Appx787 at [0046]. The PDP context admittedly does not identify any networks that may or may not be accessible via the SGSN.

The Court also cannot affirm the FWD based on Microsoft’s alternative argument that the PDP context identifies the SGSN and, thus, indirectly “identifies” UTRAN 120 because it is the only network accessible via the SGSN. This is because the Board did not rely on Microsoft’s alternative theory in the FWD. *See In re Applied Materials, Inc.*, 692 F.3d 1289, 1294 (Fed. Cir. 2012) (“The Board’s judgment must be reviewed on the grounds upon which the Board actually relied.”) (citations omitted);

Appx221-222 (Institution Decision) (citing but not relying upon Microsoft's alternative argument).

Moreover, Microsoft's alternative argument fails because the SGSN plainly serves UTRAN 120 *and* the GPRS core network, meaning that UTRAN 120 is not the only communications network accessible by the SGSN:



Appx362 (Reply); Appx111 (Petition). Accordingly, the PDP context's identification of the SGSN does not mean that it is "communications information for" any particular network accessible via the SGSN because there are multiple networks that are served by the SGSN and the PDP context does not contain any information *about* or *for* those two networks whatsoever. Appx382 (Sur-Reply).

Thus, after construing communications information, the Court should reverse the Board's FWD that the teachings of Flore anticipate the "communications information" element of the '988 Patent.

### **III. THE FINAL WRITTEN DECISION SHOULD BE REMANDED BECAUSE THE BOARD FAILED TO CONSTRUE "DISTRIBUTED"**

The Board committed legal error in failing to resolve the parties' dispute over the construction of "distributed." Therefore, to the extent the Court does not reverse the FWD based on its reliance on a misconstruction of "communications information," the FWD should be vacated and remanded for the Board to construe this important claim limitation.

#### **A. The Parties Had a Dispositive Dispute Over the Construction of "Distributed"**

The parties, experts, and Board all agreed that the Challenged Claims require a *distributed* mobile architecture but disagreed as to the meaning of distributed in that context. Lemko requests that the Court vacate the FWD and remand the proceedings to the Board to resolve this dispositive claim construction issue.

The Board failed to resolve the parties' claim construction dispute over the plain meaning of the term "distributed." Appx13 (FWD) ("We need not assign further meaning to the term 'DMA' because determining that Patent Owner's construction is incorrect sufficiently decides the issues before us."). Lemko presented a host of intrinsic and extrinsic evidence supporting its contention that "[t]he term 'distributed

mobile architecture (DMA)’ should be construed consistent with the plain meaning of its words and the inventor’s description, which require ***a mobile architecture with distributed functionality and organization, instead of centralized functionality and hierarchal organization.***” Appx293 (POR) (emphasis added).

The Board erred in declining to give a construction to DMA or, at least, to the “distributed” portion of the term. Without deciding what the important term actually requires, the Board could not find that Flore anticipated the Challenged Claims, and it is not possible for the Court to meaningfully review the soundness of the FWD.

Just as district courts must, “[w]hen the parties raise an actual dispute regarding the proper scope of . . . claims, . . . resolve that dispute,” *O2 Micro Int’l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1360 (Fed. Cir. 2008), the Board also must resolve such disputes in the context of IPRs. *See CSR, PLC v. Skullcandy, Inc.*, 594 F. App’x 672, 678 (Fed. Cir. 2014) (“The Board erred by failing to construe ‘threshold value’ as it is used in claims 1-6 before finding that [a prior art reference] failed to disclose a ‘threshold value’” in anticipation.). Indeed, without resolving the legal question of the scope of the Challenged Claims, it was impossible for the Board to have found substantial evidence to support anticipation. *Homeland Housewares, LLC v. Whirlpool Corp.*, 865 F.3d 1372, 1374-75 (Fed. Cir. 2017) (the Board must construe the claims before determining whether they are infringed, obvious, or anticipated).

In addition to claim construction arguments directed to the meaning of the full “distributed mobile architecture” term, Lemko argued that the ’988 Patent uses the term

“distributed” in accordance with its plain and ordinary meaning, which distinguishes communications networks that use network architectures with centralized organization and functionality from the claimed networks where routing functionality is distributed:

The term “distributed mobile architecture (DMA)” should be construed consistent with the plain meaning of its words and the inventor’s description, which ***require a mobile architecture with distributed functionality and organization, instead of centralized functionality and hierarchal organization.***

Appx293 (POR) (emphasis added); *see also* Appx277 (POR); Appx289-292 (POR) (describing Flore’s conventional, hierarchical networks); Appx293-296 (POR) (arguing that the ’988 Patent uses the term “distributed” consistently with its plain and ordinary meaning). Again, and as reflected in the passage above, Lemko’s position that “distributed” has a plain and ordinary meaning was not an assertion that it has no meaning and should be ignored. Instead, Lemko was clear that “distributed” requires that the mobile architecture have functionality that is distributed in contrast to a centralized and hierarchical mobile architecture, as is found in Flore.

Rather than address this argument or show how the art of record teaches a DMA under Lemko’s proposed construction, Microsoft’s Reply offered an alternative plain meaning of the term “distributed.” Appx348 (Reply) (acknowledging that “the parties’ dispute appears to focus on the term ‘distributed’”). In contrast to Lemko’s proposed construction which required distributed functionality and organization, Microsoft contended that “[t]he plain meaning of ‘distributed’ . . . is ‘something that is part of a

broader network or intended to be part of a broader network.” Appx349 (Reply) (citing Appx1969 at 13:22-14:10 (Ex. 2027) (Proctor Tr.)). Microsoft exclusively relied on its infirm proposed construction and did not attempt to show that Flore could anticipate the challenged claims under Lemko’s proposed construction. *See* Appx388-390 (Sur-Reply) (observing that Microsoft presented no argument or evidence responding to Lemko’s plain meaning claim construction argument). Thus, this dispute was dispositive on anticipation because Microsoft effectively conceded that Flore is not distributed under Lemko’s construction.

The Board rightly did not adopt Microsoft’s alternative plain meaning interpretation, which was untimely, unresponsive, vague, and inconsistent with Mr. Proctor’s other statements and the balance of the intrinsic and extrinsic evidence. Appx9, Appx13-14 (FWD) (mentioning but not adopting Microsoft’s interpretation). Although a Petitioner may **respond** to a claim construction argument made in a POR, and may offer arguments about how the prior art satisfies the construction, it may not introduce an entirely new “argument in reply that it could have presented earlier.” *Axionics, Inc. v. Medtronic, Inc.*, 75 F.4th 1374, 1383 (Fed. Cir. 2023); *id.* at 1380 (quoting U.S. Patent Trial and Appeal Board, Consolidated Trial Practice Guide, at 73 (Nov. 2019)). Petitioner’s construction was, therefore, untimely because it could have been presented earlier and did not respond or attempt to rebut Lemko’s argument.

Thus, the Board found anticipation without deciding the construction of a disputed claim term and without adopting Microsoft’s proposed construction, upon

which its anticipation ground depended. Instead, in response to all of the arguments and evidence directed to this issue, the Board (1) repeated Lemko’s proposed construction (Appx8); (2) mentioned, without endorsing, Microsoft’s proposed “plain meaning” of distributed (Appx9); and (3) determined that it “need not assign further meaning to the term ‘DMA’ because determining that Patent Owner’s construction is incorrect sufficiently decides the issues before us” (Appx13) (FWD). The Board did not mention the experts’ agreement that DMAs require distributed functionality, did not determine that Petitioner’s construction was correct, and did not find that the term “distributed” has some other plain meaning to a POSITA. It just declined to resolve the dispute. Appx8-14 (FWD).

As discussed below, because the Board failed to construe “distributed,” the FWD should be vacated and the case remanded for the Board to resolve the parties’ dispositive claim construction dispute.

## **B. Remand is Necessary to Resolve the Parties’ Claim Construction Dispute**

The Board’s failure to construe “distributed” runs afoul of this Court’s precedent for three independent reasons, necessitating vacatur and remand.

*First*, given the importance of “distributed” to resolution of Microsoft’s anticipation ground, the Board could not leave the term unconstrued. “A determination that a claim term ‘needs no construction’ or has the ‘plain and ordinary meaning’ may be inadequate when a term has more than one ‘ordinary’ meaning or when reliance on

a term's 'ordinary' meaning does not resolve the parties' dispute.” *O2 Micro Int’l*, 521 F.3d at 1361. Here, the Board left unresolved the parties’ critical dispute over the scope of the Challenged Claims. In particular, the parties disagreed as to if Flore’s conventional mobile architectures were the same as the claimed ***distributed*** mobile architecture.

Before and during trial, Lemko consistently argued that the plain meaning of the term “distributed” in the phrase DMA requires a mobile architecture with distributed organization and functionality. Appx276 (POR), Appx277-283 (POR) (conventional cellular networks depend on centralized organization and functionality), Appx283-289 (POR) (Lemko’s DMA eliminated the need for centralized hubs), Appx291 (POR) (“The 3G and 4G networks that are connected in Flore both rely on the centralized and hierarchical network architecture described in § II.A, *supra*.”), Appx293-296 (POR) (the plain meaning of distributed requires distributed functionality and organization), Appx304-306 (POR) (Flore’s 3G and 4G networks rely on centralized hubs for call routing).

Lemko also consistently distinguished Flore’s conventional, hierarchical, centralized mobile architecture on the basis that it was not a distributed mobile architecture. *See, e.g.*, Appx168 (POPR) (“There is nothing ‘distributed’ about the conventional, hierarchical networks disclosed in Flore, and Petitioners do not even attempt to explain what it is about the components of these networks that make them

part of a DMA network.”); Appx304-310 (POR). Meanwhile, Microsoft articulated its own alleged plain meaning of the term to attempt to cover Flore. Appx349 (Reply).

The Board’s failure to resolve the parties’ arguments directed to the plain meaning of the term “distributed” before purporting to adopt an unexpressed plain meaning construction was in error. The Court should, therefore, vacate the FWD and remand to determine the proper construction of this claim term in the first instance. *O2 Micro Int’l*, 521 F.3d at 1362-63.

**Second**, the Board erred because its undisclosed plain-meaning construction failed to incorporate the parties’ **agreement** that DMAs require distributed functionality. Appx13 (FWD). In *Qualcomm Inc. v. Intel Corp.*, 6 F.4th 1256, 1263 (Fed. Cir. 2021), this Court determined that the Board may not adopt a construction that diverges from a “part of the claim construction [that] was not in dispute.” Both experts in this case agreed that DMAs require distributed functionality, and while Microsoft floated a different “plain meaning” interpretation of the term, it did not **dispute** Lemko’s position (or its own expert’s testimony) that at least some functionality must be distributed among the nodes of the mobile architecture. *See* Appx348-349 (Reply); Appx1969 at 14:11-15:4 (Proctor Tr.) (Microsoft’s expert testimony that “distributed” refers to distributed functionality or information). Yet nothing in the Board’s claim construction reflects, or offers any reason from departing from, this agreement the DMA must have distributed functionality.

In any case, neither party could have anticipated that the Board would adopt a “plain meaning” of this disputed term without telling the parties what that meaning was. Appx13-14 (FWD); *SAS Inst., Inc. v. ComplementSoft, LLC.*, 825 F.3d 1341, 1351 (Fed. Cir. 2016) (the Board may not adopt a construction that the parties did not request and could not anticipate), *rev’d on other grounds*, *SAS Inst., Inc. v. Iancu*, 584 U.S. 357 (2018). Accordingly, the FWD so that the Board may determine in the first instance (1) whether the Challenged Claims require distributed functionality, (2) what functionality must be distributed, and (3) whether Flore teaches such distributed functionality.

**Third** and finally, the Board erred in determining that distributed mobile architecture encompasses network architectures having centralized, hierarchal organization. Appx18-19 (FWD); Appx26 (FWD) (“Nor does the claim preclude using ‘centralized hubs for call routing’ . . . .”). The apparent basis for this determination—the Board’s finding that Figure 6 of the ’988 Patent “shows DMA servers and DMA gateways communicating in a centralized, hierarchical relationship”—must be rejected because Microsoft never made this argument, and it is wrong.

The Board was not permitted to adopt this argument because Microsoft never argued that the ’988 Patent’s Figure 6 “shows DMA servers and DMA gateways communicating in a centralized, hierarchical relationship.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1381 (Fed. Cir. 2016) (“[T]he Board must base its decision on arguments that were advanced by a party, and to which the opposing party was given a chance to respond.”) (citation omitted); Appx18-19 (FWD). Because Microsoft never

made that argument, Lemko never had a chance to address it in this context. Accordingly, the FWD must be vacated at least because Lemko did not have any opportunity to address the Board's reasoning on this point.

And in any event, the Board fundamentally misunderstood Figure 6 when it concluded that it shows a centralized hub for routing calls. Appx18-19 (FWD). Specifically, the Board confused the hierarchical relationship between DMA networks and the DMA Gateways with the distributed structure of the DMA networks themselves. Figure 6, reproduced below, shows two separate DMA networks (620, 640). Within each of the DMA networks, calls are routed among DMA servers that form a DMA network *without* traversing any centralized hub (e.g., DMA Servers 622 and 624 can communicate directly with each other through DMA network 620), allowing mobile devices within the same DMA network, such as mobile devices 632 and 634 to call each other without traversing DMA Gateway 602. Appx1478, ¶ 62 (Cooklev Decl.) (citing Appx79 at 6:46-6:62 ('988 Patent)). DMA Gateway 602 is not, therefore, "centralized" in the same way as an MSC or SGSN because it is not a centralized hub for routing calls within a DMA network. Appx1478-1479, ¶¶ 63-64 (Cooklev Decl.). This is in contrast to traditional cellular networks and Flore, which require *all calls* to be routed through a centralized hub like an MSC or SGSN, a DMA network enables.

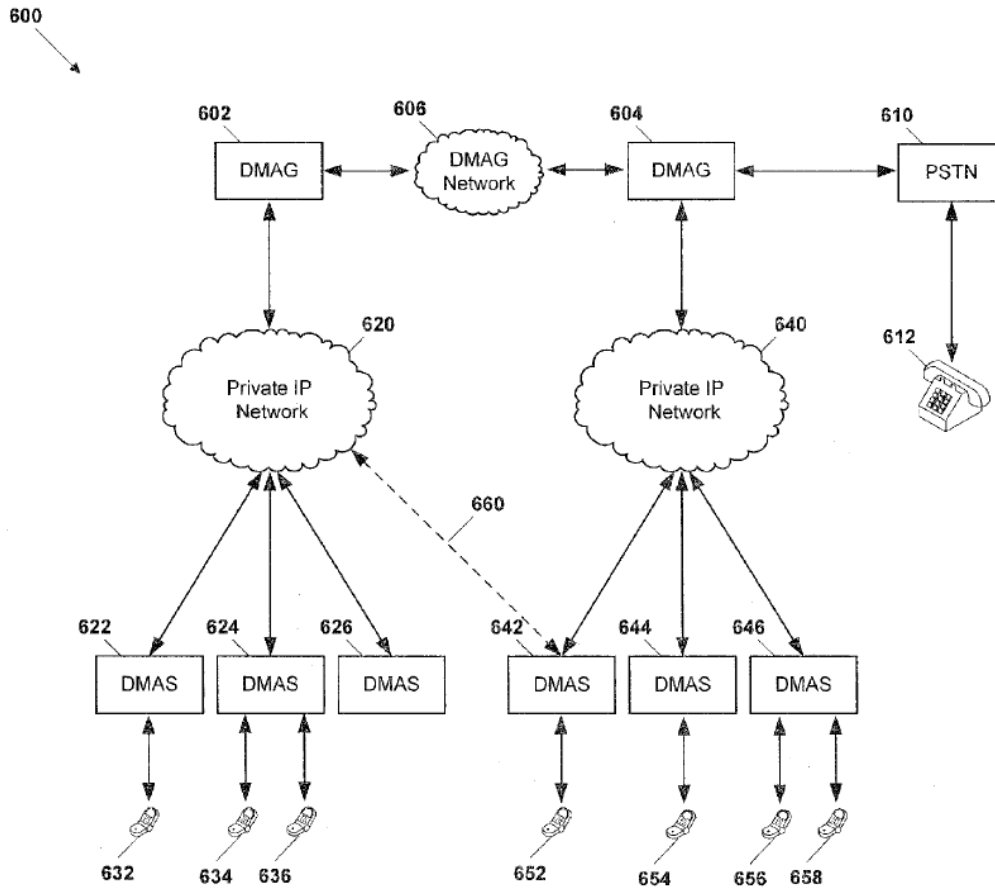


FIG. 6

Appx67, FIG. 6 ('988 Patent).

The Board focused on the hierarchical relationship between the DMA networks and the DMA Gateways. But rather than being a centralized hub for routing all calls, the DMA Gateways are only there to bridge separate networks and only route those calls which are destined for a device in a different network altogether. Appx81 at 10:24-26 ('988 Patent) ("As shown in FIG. 6, the groups of DMA servers communicating via the two private IP networks 620 and 640 are separate networks."); *id.* at 10:53-56 ("Embodiments of the present disclosure enable devices on separate networks to

communicate with each other via DMA gateways that bridge separate network and communications systems.”). Thus, use of DMA Gateways to interconnect disjointed DMA networks is not a basis to conclude that DMA networks themselves need not be distributed.

For at least the foregoing reasons, the Board’s determination that DMAs can have “centralized hubs for call routing” should be rejected because it was not based on any argument Microsoft made and because it misunderstands the intrinsic record. The Court should determine, therefore, that the plain meaning of “distributed” excludes mobile architectures that rely on centralized hubs for call routing.

\* \* \*

In finding the Challenged Claims anticipated by Flore, the Board determined that Flore’s RNC and AGW are “distributed,” but it never articulated what meaning of “distributed” it applied to reach the conclusion and it never resolved the parties’ disputes the construction of this term. The Court should, therefore, vacate the FWD and remand so that the Board can evaluate Lemko’s claim construction argument in the first instance.

### **CONCLUSION**

Lemko respectfully requests that the Court reverse the Board’s Final Written Decision and find patentable Claims 1, 3-9, and 20 of the ’988 Patent. In the alternative, Lemko respectfully requests that the Court vacate the Board’s Final Written Decision and remand for further proceedings.

Respectfully submitted,

Dated: January 29, 2025

By: /s/ Aaron M. Frankel

Paul J. Andre  
Lisa Kobialka  
James Hannah  
KRAMER LEVIN NAFTALIS  
& FRANKEL LLP  
333 Twin Dolphin Drive, Suite 700  
Redwood Shores, CA 94065  
Telephone: (650) 752-1700  
Facsimile: (650) 752-1800  
pandre@kramerlevin.com  
lkobialka@kramerlevin.com  
jhannah@kramerlevin.com

Aaron M. Frankel  
Jeffrey Price  
Jeffrey Eng  
KRAMER LEVIN NAFTALIS  
& FRANKEL LLP  
1177 Avenue of the Americas  
New York, NY 10036  
Telephone: (212) 715-9100  
afrankel@kramerlevin.com  
jprice@kramerlevin.com  
jeng@kramerlevin.com

*Attorneys for Appellant*  
Lemko Corp.

**ADDENDUM – TABLE OF CONTENTS**

| <b>Paper or Exhibit No.</b> | <b>Date</b> | <b>Document Description</b>                            | <b>Appx No.</b> |
|-----------------------------|-------------|--------------------------------------------------------|-----------------|
| 31                          | 09/10/2024  | Final Written Decision – IPR2023-00531                 | Appx1           |
| 14                          | 11/17/2023  | Order: Denying Director Review of Institution Decision | Appx51          |
| 1001                        |             | U.S. Patent No. 7,855,988                              | Appx61          |

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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MICROSOFT CORPORATION and AFFIRMED NETWORKS, INC.,  
Petitioner,

v.

LEMKO CORPORATION,  
Patent Owner.

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IPR2023-00531  
Patent 7,855,988 B2

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Before FRANCES L. IPPOLITO, BRIAN D. RANGE, and  
SCOTT RAEVSKY, *Administrative Patent Judges*.

RAEVSKY, *Administrative Patent Judge*.

JUDGMENT  
Final Written Decision  
Determining All Challenged Claims Unpatentable  
*35 U.S.C. § 318(a)*

## I. INTRODUCTION

### A. Background

Microsoft Corporation and Affirmed Networks, Inc. (collectively, “Petitioner”) filed a Petition (Paper 3, “Pet.”) requesting *inter partes* review of claims 1, 3–9, and 20 of U.S. Patent No. 7,855,988 B2 (Ex. 1001, “the ’988 patent”). Lemko Corporation (“Patent Owner”) filed a Preliminary Response (Paper 7, “Prelim. Resp.”). Based on the information presented in the Petition, we instituted an *inter partes* review of claims 1, 3–9, and 20 (Paper 8). Subsequent filings include a Patent Owner Response (Paper 15, “PO Resp.”), a Petitioner Reply (Paper 21, “Reply”), and a Patent Owner Sur-reply (Paper 22, “Sur-reply”). We held an oral hearing on July 11, 2024, a transcript of which has been entered into the record (Paper 30, “Tr.”).

We have jurisdiction over this proceeding under 35 U.S.C. § 6(b). After considering the evidence and arguments of the parties, we determine that Petitioner has proven by a preponderance of the evidence that claims 1, 3–9, and 20 are unpatentable.

### B. Related Proceeding

Petitioner indicates, and Patent Owner agrees, that the ’988 patent is asserted in *Lemko Corporation v. Microsoft Corporation*, No. 3:22-cv-00363 (N.D. Tex.). Pet. 26; Paper 4, 1.

### C. The ’988 Patent (Ex. 1001)

#### 1. Disclosure

The ’988 patent, titled “System, Method, and Device for Routing Calls Using a Distributed Mobile Architecture,” relates to “routing

communications between distributed mobile architecture (DMA) servers using DMA gateways.” Ex. 1001, code (54), 2:64–66.

The ’988 patent explains that “[c]urrent telephone systems are expensive to deploy,” for example, where “a typical cellular system that includes a mobile switching center (MSC), a base station controller (BSC), and a home location register/visitor location register (HLR/VLR) can cost over \$2.0 million” and “may require a minimum of ten thousand users in order to be economically viable.” Ex. 1001, 1:37–44. The ’988 patent recognizes that “[i]n many rural areas, the population is not large enough to support the installation of such a system.” *Id.* at 1:44–45.

Accordingly, the ’988 patent proposes a distributed and associative telecommunications system with the controlling logic distributed and decentralized. Ex. 1001, 6:63–65. An exemplary system is depicted in Figure 4, and is reproduced below.

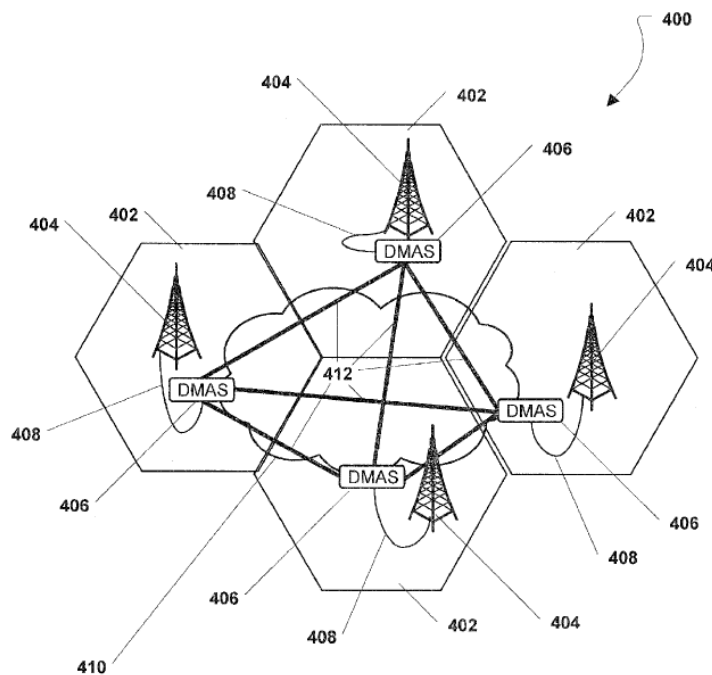


FIG. 4

Figure 4 of the '988 patent shows a non-limiting, exemplary embodiment of a distributed and associated telecommunications system 400. *Id.* at 6:31–33. As shown in Figure 4, system 400 includes multiple coverage sites 402, each having an antenna 404 that “is connected to a transceiver belonging to a base transceiver station (BTS).” *Id.* at 6:33–37. Each antenna 404 can also be connected to a DMA server 406 that “is physically and directly connected to its respective antenna 404.” *Id.* at 6:38–42. The DMA servers can be connected to each other via Internet Protocol network 410 such that “there exists a peer-to-peer connection 412 between each DMA server 406 in the system 400.” *Id.* at 6:46–49.

However, “in not all cases will the DMA servers 406 be able to participate as peers in an IP network 410.” Ex. 1001, 9:12–14. Namely, “if one or more of the coverage sites 402 are in rural locations or other locations

remote from other coverage sites 402, there may not be access to the IP network 410 in the remote coverage sites 402.” *Id.* at 9:14–17. In such cases, DMA gateways enable DMA servers to communicate with each other and enable devices in legacy networks to communicate with devices serviced by DMA servers. *Id.* at 9:17–24, Fig. 6.

## 2. *Claims 1, 3–9, and 20*

Claim 1 is illustrative of the challenged claims:

1. [Preamble] A method, comprising:

[1b] receiving at a first distributed mobile architecture (DMA) gateway communications information for a communications network accessible by a second DMA gateway, the communications information indicating one or more devices accessible by one of a DMA server and a legacy communications network, wherein the first DMA gateway and the second DMA gateway participate in a DMA gateway communications network;

[1c] storing the communications information in a home DMA register of the first DMA gateway;

[1d] receiving a communication at the first DMA gateway for a target device indicated by the communications information to be served by the second DMA gateway; and

[1e] routing the communication from the first DMA gateway to the target device by relaying the communication from the first DMA gateway to the second DMA gateway via the DMA gateway communications network.

Ex. 1001, 19:30–47.

### *D. Asserted Challenge*

Petitioner contends that claims 1, 3–9, and 20 of the ’988 patent are unpatentable under the following challenge (Pet. 2):

| Claims Challenged | 35 U.S.C. §        | References/Basis   |
|-------------------|--------------------|--------------------|
| 1, 3–9, 20        | § 102 <sup>1</sup> | Flore <sup>2</sup> |

Petitioner also relies on the Declaration of James Proctor (Ex. 1003). Patent Owner relies on the Declaration of Todor Cooklev, Ph.D. (Ex. 2021).

## II. ANALYSIS

### A. Principles of Law

Petitioner bears the burden to demonstrate unpatentability, and that burden never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

To show anticipation under 35 U.S.C. § 102, each and every claim element, arranged as in the claim, must be found in a single prior art reference. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359 (Fed. Cir. 2008). The prior art need not, however, use the same words as the claims. *In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009). The anticipation inquiry takes into account the literal teachings of the prior art reference and inferences the ordinarily skilled person would draw from it. *Eli Lilly and Co. v. Los Angeles Biomedical Res. Inst. at Harbor-UCLA Med. Ctr.*, 849 F.3d 1073, 1074–75 (Fed. Cir. 2017).

<sup>1</sup> The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), amended 35 U.S.C. § 102. Because the challenged claims of the ’988 patent have an effective filing date before the effective date of the applicable AIA amendment, we refer to the pre-AIA version of 35 U.S.C. § 102 throughout this Decision.

<sup>2</sup> U.S. Publication No. 2007/0021120 A1 to Flore, published Jan. 25, 2007 (Ex. 1005).

*B. Level of Ordinary Skill in the Art*

Petitioner defines the person of ordinary skill in the art as follows: “As of 2008, a person of ordinary skill in the art [POSA or POSITA] . . . of the ’988 patent’s field would have had a bachelor’s degree in electrical engineering, computer engineering or an equivalent, as well as two years of industry experience related to telecommunications networks.” Pet. 3 (citing Ex. 1003 ¶ 56). Petitioner also asserts that “[a]dditional graduate education . . . could substitute for professional experience, or significant experience in the field could substitute for formal education.” *Id.*

Patent Owner “applies this definition of a POSITA for its analysis.” PO Resp. 18.

Based on the complete record now before us, we adopt Petitioner’s undisputed proposal as reasonable and consistent with the prior art and the ’988 patent. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (the prior art may reflect an appropriate level of skill in the art).

*C. Claim Construction*

In *inter partes* review, we construe a claim using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent. 37 C.F.R. § 42.100(b).

The Petition does not propose any constructions. Post-institution, the parties address the meaning of the following claim term.

1. “*distributed mobile architecture (DMA)*”

Patent Owner asserts that distributed mobile architecture (DMA) should be construed as:

(1) a network architecture where DMA servers have distributed call-routing functionality and (2) are connected with other DMA servers through peer-to-peer connections (*i.e.* without connecting through a hierarchical, network-hub architecture), and (3) that is not a legacy communications network.

PO Resp. 18. We address the first two parts of this proposed construction in the next section and the third part in the following section.

*a. (1) a network architecture where DMA servers have distributed call-routing functionality and (2) are connected with other DMA servers through peer-to-peer connections (i.e. without connecting through a hierarchical, network-hub architecture)*

Patent Owner asserts that DMA should be construed “consistent with the plain meaning of its words and the inventor’s description.” PO Resp. 18. According to Patent Owner, this requires “a mobile architecture with distributed functionality and organization, instead of centralized functionality and hierarchal organization.” *Id.*

Regarding “call-routing functionality,” Patent Owner asserts that the ’988 patent specification consistently uses the term DMA to refer to “a mobile communications architecture where routing functionality, and the information necessary to route calls, is distributed among DMA servers of a DMA network.” *Id.* at 19–20 (citing Ex. 2021 ¶¶ 61–62; Ex. 1001, 6:63–65, code (57), 4:1–19, 9:36–11:27, Figs. 1, 5, 6:46–6:62). In addition, Patent Owner asserts, the DMA network must be “self-healing and redundant” as described in the specification. *Id.* at 20 (citing Ex. 1001, 6:65–7:12; Ex. 2021 ¶ 63). Patent Owner further asserts that Petitioner’s expert agreed that

“distributed” requires call routing functionality to be distributed among the DMA systems. *Id.* at 21 (citing Ex. 2026, 74:3–22 (testifying that “distributed” means that “[t]here needs to be functionality distributed”), 71:19–72:4).

As for “peer-to-peer connections,” Patent Owner reasons that because the DMA is decentralized with call routing functionality, each DMA server has peer-to-peer connections with other DMA servers. *Id.* (citing Ex. 1001, 6:46–49; Ex. 2021 ¶ 66). Patent Owner further relies on Figure 4 and its description of “*peer-to-peer connection* 412 between each DMA server,” such that “the DMA servers can communicate without an intervening MSC.” *Id.* at 22–23 (citing Ex. 1001, 6:46–49; Ex. 2021 ¶ 67). Patent Owner also disagrees with the Institution Decision’s preliminary finding that no peer-to-peer DMA connections are required because the ’988 patent states that “in not all cases will the DMA servers 406 be able to participate as peers in an IP network 410.” *Id.* at 23 (citing Dec. 13; Ex. 1001, 6:31–33, 9:12–14). Patent Owner emphasizes that when “DMA servers are able to connect as peers with an existing DMA network, they do so” and that the new DMA server is just the initial node for a new peer-to-peer network. *Id.* at 23–24 (citing Ex. 1001, 9:9–24, Fig. 6; Ex. 2021 ¶ 69).

Petitioner disagrees, contending that DMA should be accorded its plain meaning and that no special definition or disclaimer dictates a different result. Reply 1. Relying on its expert, Petitioner describes the plain meaning of “distributed” as “something that is part of a broader network or intended to be part of a broader network.” *Id.* at 2 (citing Ex. 2027, 13:22–14:10).

Petitioner further argues that the plain claim language does not support Patent Owner’s construction because no challenged claim “is directed to the distributed mobile architecture *itself*” or even a “DMA system.” *Id.* Petitioner also takes exception with Patent Owner’s proposal to “import its lengthy construction for [DMA] . . . into *every* instance where it is used as a prefix or qualifier for specific components.” *Id.* at 2–3. Further, Petitioner adds, none of the claims “requires that any action or method step be performed by a DMA server, much less requires multiple DMA servers connected through peer-to-peer connections.” *Id.* at 3. Petitioner also asserts that “the claim language places no constraint on the connections between DMA servers or on call-routing functionality of DMA servers.” *Id.* at 4.

As for the specification, Petitioner views Patent Owner’s proposal as improperly importing embodiments into the claims. *Id.* at 5. Petitioner contends that Patent Owner relies on specification passages that describe “exemplary” and “permissive,” rather than definitional, language. *Id.* at 5–6 (citing PO Resp. 19–22, 25 (relying on, e.g., Ex. 1001, Figure 4); Ex. 1001, 6:31–32 (“**FIG. 4 illustrates a non-limiting, exemplary embodiment . . .**”), 6:52–53 (“**For example**, the DMA servers 406 *can* switch and route calls . . .”)).

We agree with Petitioner that Patent Owner’s “call routing” and “peer-to-peer” constructions are incorrect. Patent Owner does not persuasively argue why the claim should be rewritten to require “distributed call routing functionality” or “peer-to-peer connections,” let alone read these functions into every instance where “DMA” is used as a prefix or qualifier for other terms (such as DMA gateway, DMA server, and DMA gateway

communications network). Patent Owner merely cites several passages of the specification and asserts that the claim should read as it says. PO Resp. 19–21. With no explanation as to why the specification should limit the claims, Patent Owner’s argument has no persuasive legal basis.

Our reviewing court “has repeatedly cautioned against limiting the claimed invention to preferred embodiments or specific examples in the specification.” *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1346–47 (Fed. Cir. 2015). “Absent disclaimer or lexicography, the plain meaning of the claim controls.” *Toshiba Corp. v. Imation Corp.*, 681 F.3d 1358, 1369 (Fed. Cir. 2012).

There is no disclaimer or lexicography in the specification that requires us to limit the claims as Patent Owner wishes. We agree with Petitioner that the passages upon which Patent Owner relies use non-limiting, exemplary language. *See* Reply 6. For example, Patent Owner relies heavily on Figure 4 and its accompanying description, but Figure 4 “illustrates a non-limiting, exemplary embodiment.” PO Resp. 19–25; Ex. 1001, 6:31. Thus, Figure 4’s references to a “peer-to-peer connection,” “switch and route call[]” functionality, that “controlling logic *can* be distributed,” and “self-healing and redundant” wireless coverage, for example, do not limit the claim. *See* Ex. 1001, 6:48, 52, 64, 66 (emphasis added).

Patent Owner also does not persuasively explain why we should disregard the ’988 patent’s exception to peer-to-peer connections, that is, “in not all cases will the DMA servers 406 be able to participate as peers in an IP network.” *Id.* at 9:12–13. Patent Owner’s assertions that when “DMA servers are able to connect as peers with an existing DMA network, they do

so,” and that the “new DMA server is just the initial node in a new peer-to-peer network,” do not find support in the specification. *See* PO Resp. 23–24 (citing Ex. 1001, 9:9–24, Fig. 6). Instead, Patent Owner cites a portion of the specification that explains “in not all cases will the DMA servers 406 be able to participate as peers,” such as in rural areas, in which case “DMA gateways . . . enable DMA servers to communicate with one another when one or more of the DMA serves cannot participate directly in the IP network.” Ex. 1001, 9:12–21. Nothing in this passage suggests that a DMA server not acting as a peer would merely be a temporary condition and that once able to connect as a peer, it would do so. Such reasoning is gloss added by Patent Owner and Patent Owner’s expert, Dr. Cooklev, whose testimony on this point mirrors the Response. Ex. 2021 ¶ 69. We do not find Dr. Cooklev’s testimony credible on this point because the testimony does not align with the ’988 patent specification.

The Sur-reply changes tack, arguing that DMA has no plain and ordinary meaning in the art, so we should construe it “only as broadly as provided for by the patent itself.” Sur-reply 10–12 (citing *Irdeto Access, Inc. v. Echostar Satellite Corp.*, 383 F.3d 1295, 1300 (Fed. Cir. 2004); *Vehicle IP, LLC v. Cellco P’ship*, 757 F. App’x 954, 958 (Fed. Cir. 2019)). Patent Owner further asserts that “it is undisputed” that DMA “lacks an established meaning.” *Id.* at 12. This assertion appears to mischaracterize the Reply because Petitioner actually argues that “the term should be accorded . . . its plain and ordinary meaning of each of its individual terms.” Reply 1. And Patent Owner *itself* asserts in the Response that DMA should be construed “consistent with the *plain meaning of its words* and the inventor’s description.” PO Resp. 18 (emphasis added). Patent Owner’s

positions that DMA has its “plain meaning” but that the term “does not have a plain and ordinary meaning” are irreconcilable. *Compare id.*, with Sur-reply 12. To the extent Patent Owner abandons its earlier “plain meaning” argument in favor of a new one, the Sur-reply’s argument is untimely and not responsive to the Reply, and we do not consider it. *See* 37 C.F.R. § 42.23(b) (“A sur-reply may only respond to arguments raised in the corresponding reply . . .”). Moreover, even if DMA lacks “plain and ordinary meaning,” the specification does not support Patent Owner’s proposed construction for the reasons we explain herein.

Finally, we disagree with Patent Owner that Petitioner’s expert, Mr. Porter, conceded that “distributed” requires call routing functionality be distributed among the DMA systems. PO Resp. 21 (citing Ex. 2026, 74:3–22). The primary testimony Patent Owner relies on from Mr. Porter is his assertion that “distributed” means that “[t]here needs to be functionality distributed.” *Id.* (citing Ex. 2026, 71:19–72:4). From Mr. Porter’s statement that “functionality” is distributed, it does not follow that the claim requires “*call routing* functionality” to be distributed. Yet even if Mr. Porter’s testimony somehow implies that call routing functionality must be distributed in the claims, this would contradict the permissive, non-limiting language of the specification. We may not rely on “expert testimony that contradict[s] the intrinsic evidence” to interpret claims. *AFG Indus., Inc. v. Cardinal IG Co., Inc.*, 239 F.3d 1239, 1249 (Fed. Cir. 2001).

We need not assign further meaning to the term “DMA” because determining that Patent Owner’s construction is incorrect sufficiently decides the issues before us. We agree with Petitioner that DMA “should be

accorded . . . its plain and ordinary meaning of each of its individual terms.”

Reply 1.<sup>3</sup>

*b. (3) that is not a legacy communications network*

Finally, we address Patent Owner’s contention that DMA “is not a legacy communications network.” PO Resp. 18. Patent Owner asserts that the ’988 patent distinguishes DMA from “a host of different” legacy systems, including public switched telephone network (PSTN) services, Voice over Internet Protocol (VoIP) systems, and wireless networks serviced by a mobile switching center (MSC). *Id.* at 25–26 (citing, e.g., Ex. 1001, 1:37–64, claim 5), 27–28 (citing Figure 6). “What all of these legacy

<sup>3</sup> During the hearing, Patent Owner asserted that a dictionary definition in Exhibit 3002 is relevant here. Tr. 60:25–61:9; *see* Paper 27, 3 (Board’s hearing order proposing that the parties discuss the definitions of “distributed architecture” and “distributed processing” in Exhibit 3002). That definition is for the phrase “distributed computer network,” which is defined as “a network in which all node pairs are connected, either directly or through redundant paths through intermediate nodes. *See also* decentralized computer network.” Tr. 61:6–9 (quoting Ex. 3002); *see also id.* at 62:3–14 (discussing definition of “distributed system” in Exhibit 3003). Patent Owner argues, “I think that’s important to understand is that if you’re talking about a distributed system, it’s a decentralized system.” *Id.* at 61:10–11. We find this argument and evidence unavailing because the claims do not recite a “distributed computer network,” “decentralized system,” or “distributed system.” Regardless, as we discuss in the next section, Figure 6 depicts DMA gateways and DMA servers in a hierarchical, centralized relationship, which undermines Patent Owner’s argument that DMA must mean decentralized in the context of the ’988 patent. And elsewhere, the specification uses only permissive language to refer to decentralization and refers to “distributed and decentralized” separately, suggesting these terms have different meanings. *See also* Ex. 1001, 6:63–65 (“Within the distributed and associative telecommunications system 400 the controlling logic *can* be distributed and decentralized.” (emphasis added)).

networks have in common,” Patent Owner argues, “is that they are not private peer-to-peer networks, like the DMA networks of the ’988 [p]atent.” *Id.* at 26 (citing Ex. 2021 ¶ 74).

Patent Owner also argues that the claims distinguish “(DMA) networks from these legacy communications networks.” *Id.* at 26. Claim 1, for instance, recites “one or more devices accessible by *one of* a DMA server and a legacy communications network.” *Id.* “Because the ’988 [p]atent recites both ‘DMA’ and ‘legacy communications network’ in the claims,” Patent Owner argues, “the use of these two terms requires that they connote different meanings.” *Id.* Patent Owner further relies on Figure 6 of the specification, which shows a “‘DMA’ infrastructure . . . separated from the legacy communications network.” *Id.* at 27. And Patent Owner notes that claim 5 further separates DMA networks and legacy communications networks by specifying example legacy networks like a PSTN and MSC. *Id.* at 28.

Petitioner views Patent Owner’s construction as an unsupported negative limitation. Reply 11. Petitioner takes particular issue with Patent Owner’s reference to “DMA network,” which does not appear in the claims. *Id.* at 11–13. Along those lines, Petitioner cites to our Institution Decision, where we preliminarily found that the phrases “DMA infrastructure” and “DMA network” do not appear in the claim and also remarked, “[n]or is it clear what these phrases are referring to.” *Id.* at 11 (citing Dec. 11).

We start our analysis with the claim language. Claim 1 recites “the communications information indicating one or more devices accessible by one of a DMA server and a legacy communications network.” As a preliminary matter, we agree with Petitioner that claim 1 does not

distinguish a “DMA network” from a “legacy communications network.” Reply 11–13; PO Resp. 26. The phrase “DMA network” does not appear in the claims. Rather, claim 1 refers to “one of a DMA *server* and a legacy communications network.” (Emphasis added.)<sup>4</sup>

Our reviewing court instructs that “there is a ‘presumption’ that separately listed claim limitations may indicate separate and distinct physical structure, but that presumption may always be rebutted in the context of a particular patent.” *Google LLC v. EcoFactor, Inc.*, 92 F.4th 1049, 1058 (Fed. Cir. 2024). In *EcoFactor*, the claim language and specification rebutted any presumption that five inputs listed in a certain limitation were distinct components. *Id.* That was so because the claim language placed no constraint on how to use those inputs. *Id.* The specification also contained no restrictive language requiring the claim inputs to be separate. *Id.* To the contrary, the court found, “the specification contemplates an embodiment in which one claimed input is calculated based on at least one other claimed input.” *Id.*

In the ’988 patent, claim 1 does not specify how a DMA server may differ from a legacy communications network. As in *EcoFactor*, then, claim 1 places no constraint requiring different structure or functionality between

<sup>4</sup> Patent Owner asserts that Dr. Cooklev testified that DMA is a network, but this is unavailing because the claim also does not distinguish “DMA” on its own from a legacy network. *See* Sur-reply 21–22 (citing Ex. 1014, 57:2–6). Patent Owner further asserts that whether the challenged claims recite a DMA network “is irrelevant” because the claims recite DMA gateways, DMA servers, and a DMA gateway communications network. *See id.* at 21–22. This assertion overlooks that claim 1 recites none of those things in conjunction with a legacy communications network, only a “DMA server.”

the DMA server and the legacy communications network. The specification also rebuts any presumption that these terms must be different components. For example, the specification explains that the DMA server may perform functions of a legacy communications network, such as MSC and BSC functions. *See* Ex. 1001, 7:32–34. For example, Figure 5 below depicts a DMA server (with our red oval annotation) showing this MSC and BSC functionality:

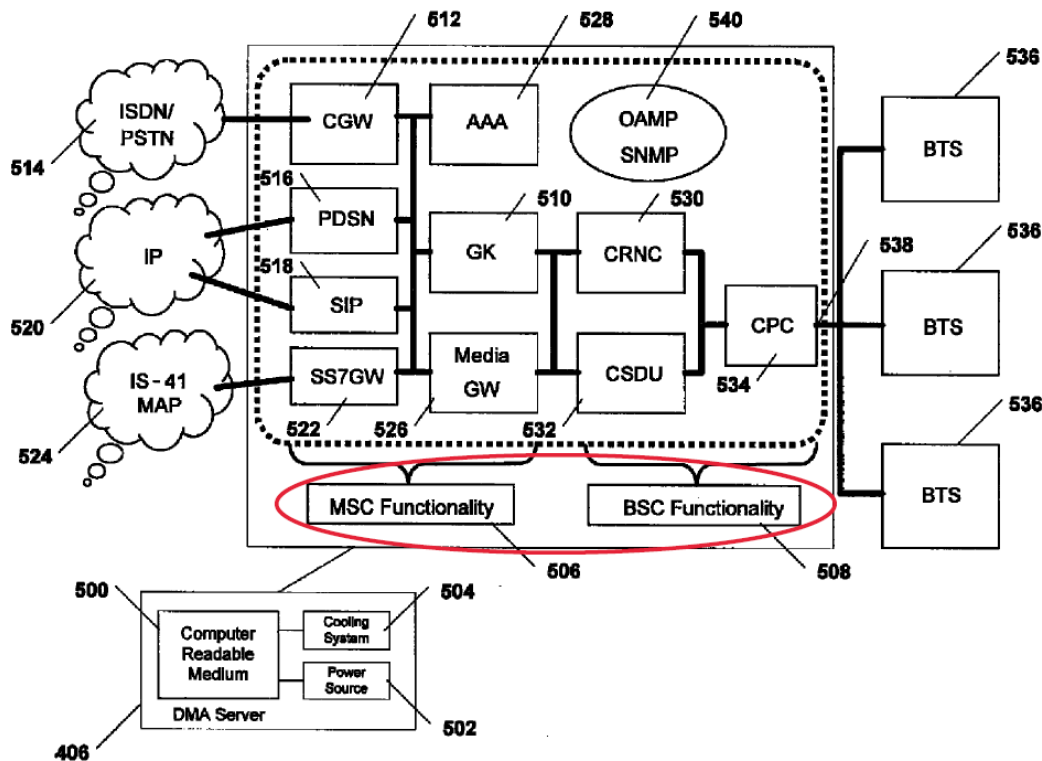


FIG. 5

The specification explains, “[a]s depicted in FIG. 5, the DMA server 406 may include a mobile switching center (MSC) module 506 and a base station controller (BSC) module 508.” *Id.* Various of the depicted components can also “perform one or more of the functions of *legacy* Base Station Controllers (BSC).” *Id.* at 8:51–53 (emphasis added).

To be sure, the background section of the '988 patent refers to disadvantages of “[c]urrent telephone systems,” such as the expense of an MSC or BSC and the difficulty of expansion or operating with existing telephone systems. Ex. 1001, 1:37–65. Yet although “disadvantages identified by the specification . . . [may] amount to implied disclaimer,” Figure 5 above melds the functionality of a DMA server and a legacy communications network (e.g., MSC, BSC) together. *See SightSound Techs, LLC v. Apple Inc.*, 809 F.3d 1307, 1317 (Fed. Cir. 2015). The specification therefore does not draw a bright line distinction between legacy communications network functionality and a DMA server.

Figure 6 (reproduced below) also shows DMA servers and DMA gateways communicating in a centralized, hierarchical relationship, which is another characteristic of legacy networks Patent Owner asserts that the “DMA” concept distinguishes. *See* PO Resp. 18 (arguing that DMA does not employ “centralized functionality and hierarchical organization”).

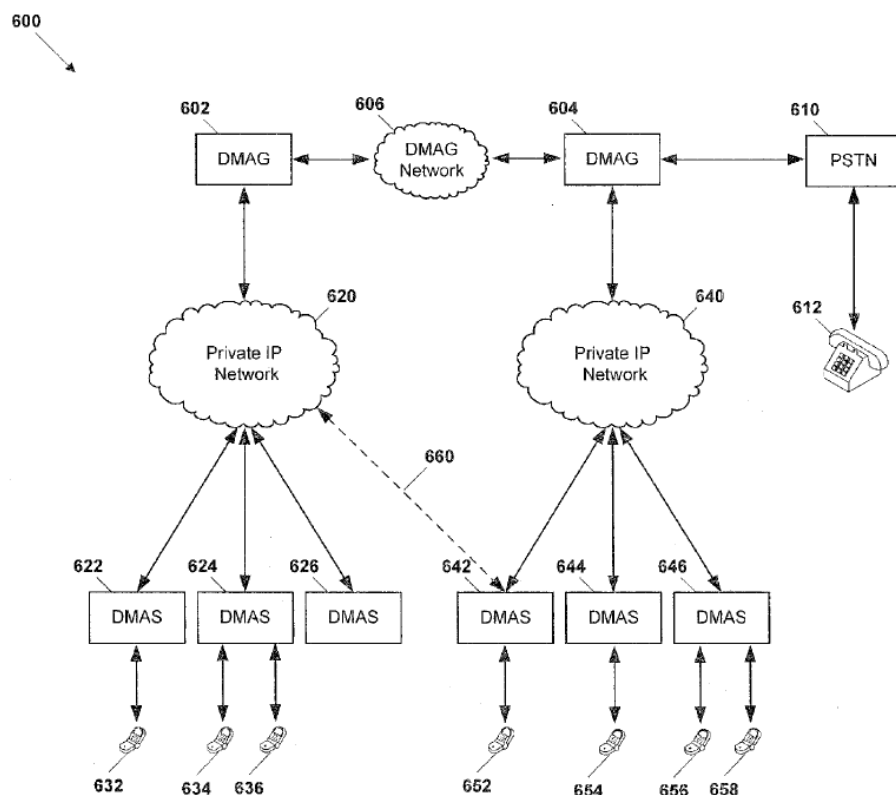


FIG. 6

That is, in Figure 6 above, DMA servers communicate with DMA gateways, which are hierarchically positioned above the DMA servers.

Accordingly, the intrinsic evidence does not require “distributed mobile architecture (DMA)” or “DMA server” to exclude a legacy communications network.

Regardless, even if we had determined that DMA (or “DMA server”) does exclude a legacy communication network, DMA would not have the implied meaning Patent Owner ascribes to it. Patent Owner asserts that because DMA must exclude a legacy communications network, DMA must be a peer-to-peer network because legacy networks are not peer-to-peer networks. *See* PO Resp. 26. For reasons we explain above, this is

unpersuasive because the specification is not limited to peer-to-peer connections between DMA servers. And critically, Patent Owner’s assertion that what “legacy networks have in common is that they are not private peer-to-peer networks” improperly reads an unsupported negative limitation into the claim. *See id.* (citing Ex. 2021 ¶ 74). Patent Owner’s argument is illogical, which can be seen by following this argument to its ultimate conclusion—that anything that legacy networks are not, must be encompassed by the term DMA. Yet legacy networks are different from many things. For example, legacy networks are not airplanes. Just because legacy networks are not airplanes does not logically impel a conclusion that DMA must encompass airplanes. In the same way, just because legacy networks might not be peer-to-peer networks does not imply that DMA encompasses peer-to-peer networks.

Not only is Patent Owner’s proposed negative limitation illogical, but it is also unsupported because the ’988 patent does not disclose that all legacy networks are not peer-to-peer networks. In fact, Patent Owner does not supply a single citation to the ’988 patent that refers to any legacy network not being a peer-to-peer network. *See* PO Resp. 26; Ex. 2021 ¶ 74. Instead, Patent Owner cites Dr. Cooklev’s declaration, which merely testifies, without citation to the ’988 patent, that “[w]hat all of these legacy networks have in common is that they are not private peer-to-peer networks, like the DMA networks of the ’988 Patent.” This unsupported testimony is unpersuasive. *See* 37 C.F.R. § 42.65(a) (“Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.”).

Thus, even if we were to adopt a construction that “DMA server” excludes a legacy communications network, Patent Owner’s additional “peer-to-peer” interpretation would be unpersuasive.

## 2. *Remaining terms*

We find it unnecessary to construe any further claim terms. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

### *D. Asserted Anticipation by Flore*

Petitioner contends that claims 1, 3–9, and 20 are anticipated by Flore. Pet. 11–25.

#### 1. *Overview of Flore*

Flore relates “to techniques for performing handover between wireless communication networks using different radio access technologies.” Ex. 1005 ¶ 3. In particular, Flore observes the desirability “for a wireless user to be able to roam seamlessly between [a] new wireless network and existing wireless networks” in order “to enjoy the performance advantages of the new wireless network and the coverage benefits of the existing wireless networks.” *Id.* ¶ 7. Accordingly, Flore describes “[t]echniques for performing inter-system handover of a user equipment (UE) from a first radio access network (RAN) to a second RAN,” where “[t]he second RAN may be a Universal Terrestrial Radio Access Network (UTRAN), and the first RAN may be an Evolved UTRAN (E-UTRAN), or vice versa.” *Id.* ¶ 8.

Figure 1 of Flore depicts an exemplary deployment with a UTRAN and E-UTRAN, and is reproduced below.

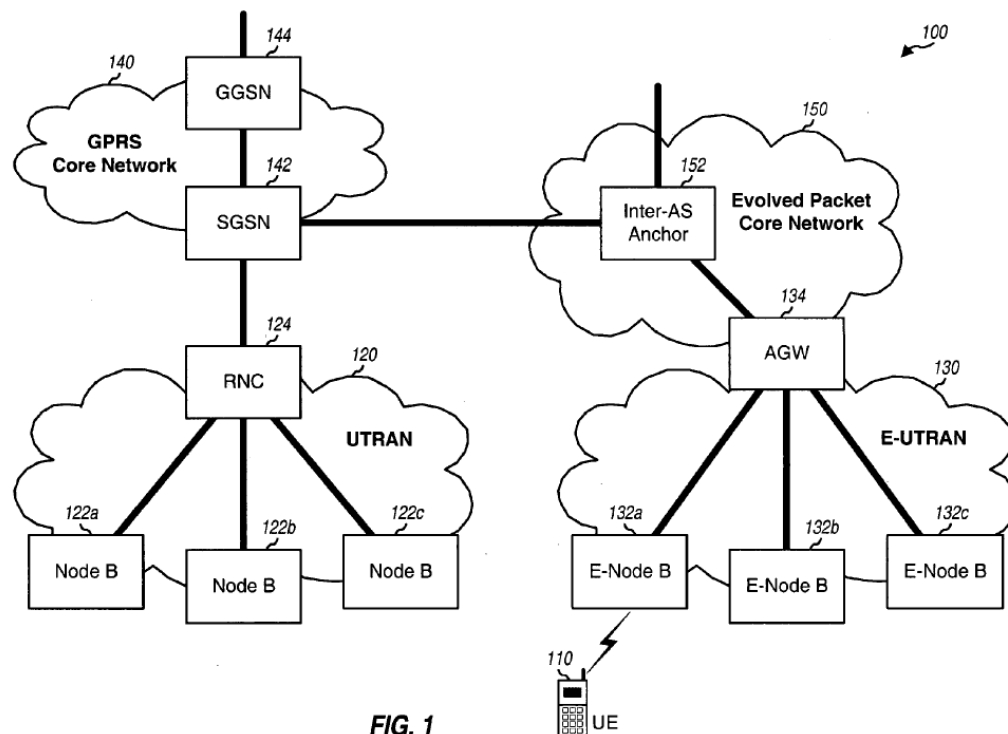


Figure 1 of Flore is an exemplary deployment 100 with a UTRAN and E-UTRAN. Ex. 1005 ¶ 13. As shown in Figure 1, deployment 100 includes UTRAN 120 with Node Bs coupled to radio network controllers (RNC) 124, and E-UTRAN 130 with Evolved Node Bs coupled to Access Gateway (AGW) 134. Ex. 1005 ¶¶ 26, 27. General Packet Radio Service (GPRS) core network 140 includes a Serving GPRS Support Node (SGSN) 142, which “interfaces with RNC 124 in UTRAN 120 and supports packet-switched services for the UEs communicating with the UTRAN.” *Id.* ¶ 28. Evolved Packet Core network 150 includes an Inter-Access System Anchor 152, which interfaces with AGW 134 in E-UTRAN 130 as well as SGSN 142 in GPRS core network 140. *Id.* ¶ 29. “Inter-AS Anchor 152 provides interoperability between E-UTRAN 130 and UTRAN 120 and GPRS core

network 140.” *Id.* Accordingly, “UE 110 may be capable of communicating with UTRAN 120 and E-UTRAN 130.” *Id.* ¶ 31.

## 2. *Independent claim 1*

### a. *A method comprising*

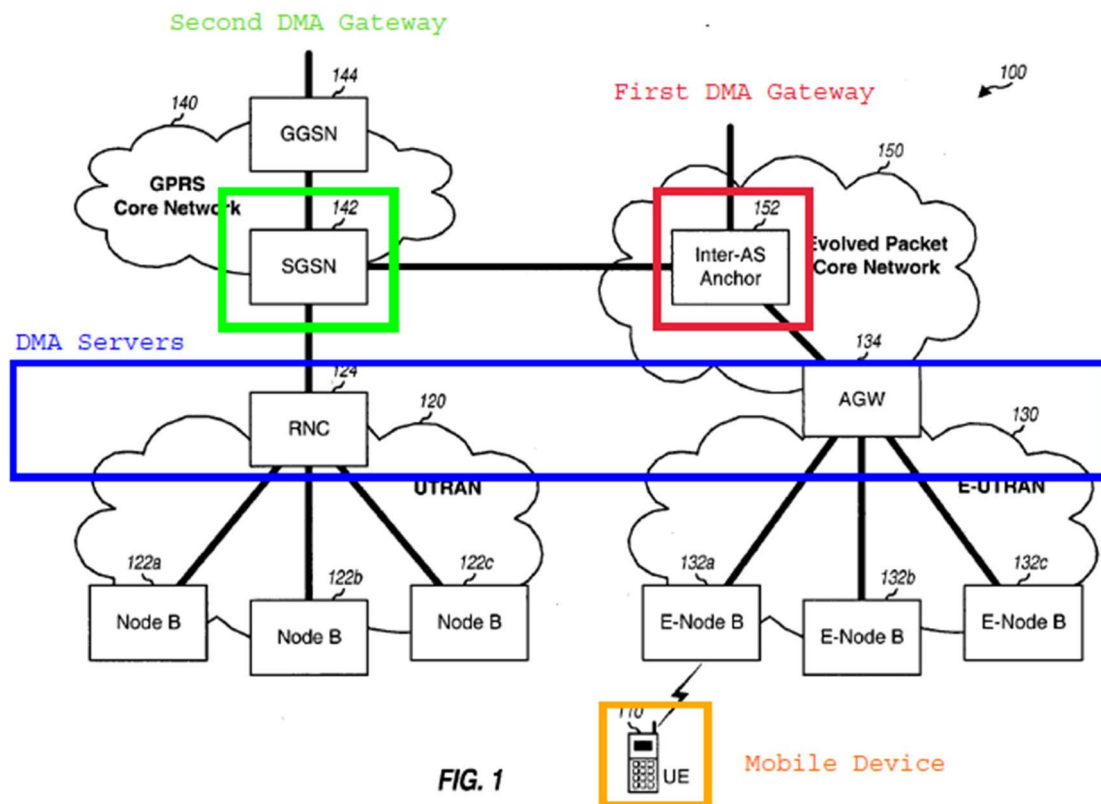
Petitioner asserts that Flore discloses the preamble’s “method” by disclosing “steps of a method or algorithm.” Pet. 11–12 (citing Ex. 1005, claim 7, ¶ 69; Ex. 1003 ¶ 85). Patent Owner does not dispute Petitioner’s arguments regarding the preamble. Petitioner has shown that Flore discloses the preamble, whether or not it is limiting.

### b. *[1b] receiving at a first distributed mobile architecture (DMA) gateway communications information for a communications network accessible by a second DMA gateway, the communications information indicating one or more devices accessible by one of a DMA server and a legacy communications network, wherein the first DMA gateway and the second DMA gateway participate in a DMA gateway communications network*

Petitioner contends that Flore teaches limitation 1[b]. Pet. 12–14. We address this limitation in the following four subsections.

### (1) “DMA” recitations: . . . *a first distributed mobile architecture (DMA) gateway . . . a second DMA gateway . . . a DMA server . . . a DMA gateway communications network*

Petitioner asserts that Flore discloses the DMA recitations of claim 1, including first and second DMA gateways and a DMA server. Pet. 12–14 (citing Ex. 1003 ¶¶ 87–93). In general, Petitioner relies on the following annotated version of Flore’s Figure 1:



Pet. 11. Figure 1 of Flore, which we describe in detail above, shows a deployment with a UTRAN and an E-UTRAN. Ex. 1005 ¶ 13. In Figure 1, Petitioner annotates Inter-AS Anchor 152 as the claimed “first DMA gateway” and SGSN 142 as the claimed “second DMA gateway.” Pet. 11. Petitioner also annotates AGW 134 and RNC 124 as examples of the claimed “DMA server.” *Id.* Petitioner further annotates UE 110 as the claimed “one or more devices.” *Id.* Petitioner also refers to the networks on the left, including the UTRAN 120 and GPRS core network 140, as “legacy networks.” *Id.* at 13.

Patent Owner contends that Flore does not disclose the claimed “distributed mobile architecture (DMA)” based on Patent Owner’s construction for DMA. PO Resp. 29–34. For instance, Patent Owner

contends that Flore’s RNC and AGW nodes are not DMA servers because they have no ability to route calls, which are instead routed by centralized MSCs. PO Resp. 29–30 (citing Ex. 2021 ¶¶ 79–81). Patent Owner also asserts that Flore does not disclose “a DMA network with DMA servers that are connected to other DMA servers through peer-to-peer connections.” *Id.* at 31.<sup>5</sup> Finally, Patent Owner asserts that Flore discloses legacy 2G, 3G, and 4G networks, and DMA excludes legacy networks. *Id.* at 34.

Petitioner’s arguments are more persuasive because Petitioner and Mr. Proctor persuasively show how each DMA recitation of claim 1 maps to a corresponding feature in Figure 1 of Flore. *See* Pet. 12–14 (citing Ex. 1003 ¶¶ 87–93). We find Mr. Proctor’s testimony credible because, as we explain, it is consistent with other evidence. Figure 1 of Flores, reproduced above, depicts, for example, separate, distributed RNC and AGW systems for communicating with a mobile device (UE 110) in a mobile communications network (e.g., elements 120, 130, 140, 150). *See* Ex. 1005 ¶¶ 24–27, 31. Mr. Proctor testifies, and we agree, that “a POSA would have understood that the RNC and AGW described in Flore serve as the ‘distributed mobile architecture (DMA) servers’ of the asserted claims.” Ex. 1003 ¶ 80.

<sup>5</sup> Patent Owner also contends that Petitioner shifts its allegation and contends that the “one or more Node Bs” are the DMA servers (not the RNC and AGW). PO Resp. 32–33. Petitioner responds, and we agree, that the “Petition consistently maintains that the RNC 124 and AGW 134 satisfy[] the ‘DMA server’ limitations, including by providing an *annotated* figure that is replicated in [Patent Owner’s] response.” Reply 13. The Sur-reply does not appear to respond on this point. We find Patent Owner’s argument unavailing.

Mr. Proctor similarly testifies, with detailed supporting citations to Flore, that a POSITA would have understood that Flore’s Inter-AS Anchor operates as the first DMA gateway and that Flore’s SGSN operates as the second DMA gateway. *Id.* ¶¶ 81, 88–90. Finally, Mr. Proctor persuasively testifies that through Flore’s Gn interface, the Inter-AS Anchor and SGSN participate in a DMA gateway communications network. *Id.* ¶ 92.

Patent Owner’s arguments rely on a claim construction for DMA that we have not adopted. Contrary to Patent Owner’s assertions, the claimed references to “DMA” do not require the ability to route calls or peer-to-peer connections. *See* PO Resp. 29–34. Nor does the claim preclude using “centralized hubs for call routing,” and DMA does not exclude a “legacy communications network.” *See id.* at 31, 34.

On this last point, even if DMA (or DMA server) were interpreted to exclude “a legacy communications network,” Petitioner argues, and Patent Owner does not dispute, that only networks 120 and 140 in Flore Figure 1 (i.e., the left half of Figure 1) are legacy communications networks. Pet. 13, 14, 20; PO Resp. 34. Petitioner does not refer to the right half of Flore Figure 1 (networks 130, 150) as legacy communications networks. *See* Pet. 13–14, 20. Petitioner maps Flore’s AGW server 134 in (non-legacy) network 130 to a DMA server, and also maps the RNC server 124 in (legacy) network 120 to a DMA server. *See id.* at 11. Thus, regardless of whether DMA server must exclude a legacy communications network, Petitioner has a persuasive mapping in Flore, legacy or non-legacy, that discloses the claimed DMA server.

Further, claim 1 does not recite a “DMA network” or multiple “DMA servers that are connected to other DMA servers through peer-to-peer

connections,” as Patent Owner asserts. *See* PO Resp. 31. Claim 1, at most, refers to one “DMA server.” It is axiomatic that limitations not appearing in the claim cannot be relied upon for patentability. *See In re Hiniker Co.*, 150 F.3d 1362, 1369 (Fed. Cir. 1998) (“[The] proffered facts . . . are not commensurate with the claim scope and are therefore unpersuasive.”). Thus, Patent Owner’s arguments based on these unclaimed terms are unavailing.

Accordingly, Petitioner persuades us that Flore discloses the DMA recitations of limitation [1b].

*(2) receiving at a first distributed mobile  
architecture (DMA) gateway communications  
information for a communications network  
accessible by a second DMA gateway*

For this portion of limitation [1b], Petitioner explains that in Flore, during a handover from one network (E-UTRAN) to another (UTRAN), “numerous messages including communication information are received by the Inter-AS Anchor 152 (the ‘first DMA gateway’).” Pet. 12 (citing Ex. 1005, Fig. 4; Ex. 1003 ¶ 88). One example of this communication information, Petitioner asserts, is “Packet Data Protocol (PDP) context,” which contains information such as routing information for IP packets. *Id.* (citing Ex. 1005 ¶ 46). Petitioner contends that Flore’s Inter-AS Anchor 152 (first DMA gateway) updates its PDP context fields for UE 110 so that future packets for that UE are forwarded to SGSN 142 (second DMA gateway). *Id.* at 12–13 (citing Ex. 1005 ¶ 46).

Further, Petitioner explains that “[Flore’s PDP context] message received by the Inter-AS Anchor 152 . . . includes information about UE 110, which following completion of the handover procedure is served by UTRAN 120, that includes SGSN 142.” *Id.* at 13 (citing Ex. 1003 ¶ 90).

Mr. Proctor testifies that “thus a POSA would have recognized that the PDP context disclosed in Flore qualifies as ‘communications information for a communications network accessible by a second DMA gateway.’” Ex. 1003 ¶ 90.

Patent Owner contends that Flore’s PDP context is not “communications information for a communications network accessible by a second DMA gateway.” PO Resp. 36 (citing Ex. 2021 ¶ 93). Patent Owner asserts that “[t]here is nothing in a PDP context that identifies any network *accessible by* a second gateway.” *Id.* (underlining added). Rather, Patent Owner contends, the PDP context identifies the SGSN 142—Petitioner’s second DMA gateway. *Id.* There is no information about any networks accessible by SGSN 142 contained in the PDP context, Patent Owner contends. *Id.* at 36–37.<sup>6</sup>

We agree with Petitioner that Flore’s PDP context discloses the claimed “communications information” received at the first DMA gateway. Flore describes the PDP context as containing “various parameters such as routing information for IP packets (e.g., the IP addresses of UE 110 and Inter-AS Anchor 152).” Ex. 1005 ¶ 46. Flore further teaches that “Inter-AS Anchor 152 updates its PDP context fields for UE 110 so that future packets

<sup>6</sup> Despite starting its argument addressing limitation [1b], Patent Owner then concludes that Flore therefore does not disclose limitation [1d], “receiving a communication at the first DMA gateway for a target device *indicated by the communications information to be served by the second DMA gateway.*” PO Resp. 37. It appears that Patent Owner’s reference to limitation [1d] here is misplaced, and the Sur-reply does not appear to directly address limitation [1d]. We therefore address limitation [1d] in a separate section below.

for the UE are forwarded to SGSN 142 instead of AGW 134.” *Id.* We credit Mr. Proctor’s testimony explaining why a person having ordinary skill in the art would have recognized that Flore’s PDP context meets this recitation:

this message received by the Inter-AS Anchor 152; *i.e.*, the “**first DMA gateway**”, includes information about UE 110, which following completion of the handover procedure is served by UTRAN 120, that includes SGSN 142 (the “**second DMA gateway**”), and thus a POSA would have recognized that the PDP context qualifies as “communications information for a communications network accessible by a second DMA gateway.”

Ex. 1003 ¶ 90.

In the Reply, Petitioner argues, and we agree, that “[t]he claims do not require that the communications information *identify a network* accessible by a second gateway,” as Patent Owner argues. Reply 15 (citing PO Resp. 36). The claim recites “receiving . . . communications information *for* a communications network accessible by a second DMA gateway,” not “identify a network.” *See id.* Thus, Patent Owner’s arguments are unavailing because they are not commensurate with the scope of claim 1.

The Sur-reply further argues that the specification requires us to interpret “communications information for a communications network” to “refer[] to the portion of register information stored in the home DMA register of a DMA gateway that identifies the communications network,” which “maps the identity of the communications network to the devices served by the network.” Sur-reply 6–8 (citing, e.g., Ex. 1001, 17:29–31, 11:20–25, 17:63–18:8, Fig. 12). Patent Owner supplies no explanation for reading in these limitations from the specification, and we decline to do so.

Thus, Patent Owner's argument based on an unclaimed identification of a network is unavailing.

Accordingly, Petitioner persuades us that Flore discloses the “receiving at a first distributed mobile architecture (DMA) gateway communications information for a communications network accessible by a second DMA gateway” portion of limitation [1b].

*(3) the communications information indicating one or more devices accessible by one of a DMA server and a legacy communications network*

Petitioner argues that Flore teaches this portion of limitation [1b] because the PDP context information identifies UE 110 undergoing handover. Pet. 13 (citing Ex. 1005 ¶ 46 (PDP context contains “routing information for IP packets (e.g., the **IP addresses of UE 110** and Inter-AS Anchor 152)”); Ex. 1003 ¶ 91). UE 110 is accessible by “legacy networks 120 and 140,” and the message facilitates handover from the E-UTRAN 130 and network 150 (i.e., non-legacy networks), Petitioner further argues. *Id.* at 13–14 (citing Ex. 1005 ¶ 29). Thus, Petitioner concludes, Flore teaches this portion of limitation [1b].

Patent Owner argues that because Flore sends its PDP context “*before* the UE is handed over to the new communications network,” the UE is still subscribed to the AGW 134 and cannot be accessed by SGSN 142 (Petitioner's second DMA gateway). PO Resp. 37 (citing Ex. 1005 ¶¶ 46, 57–58, Fig. 7). “At the time the PDP context is sent,” Patent Owner argues, “the UE is still subscribed to the first network's AGW 134, and cannot be accessed by SGSN 142, which Petitioners contend is the second DMA gateway.” *Id.* Thus, Patent Owner concludes, “the UE that is the subject of

the PDP context is not a device identified as ‘accessible by one of a DMA server and a legacy communications network’ via the second DMA gateway.” *Id.* (citing Ex. 2021 ¶¶ 95–96).

Petitioner argues, and we agree, that Patent Owner argues nonexistent claim limitations, including “that the identified device must be accessible by a DMA server *via the second DMA gateway*.” Reply 16. Patent Owner’s assertion that “the UE that is the subject of the PDP context is not a device identified as ‘accessible by one of a DMA server and a legacy communications network’ *via the second DMA gateway*” adds the words “via the second DMA gateway” to the claim and is therefore not commensurate with the scope of claim 1. *See* PO Resp. 37.

Patent Owner responds that the claim phrase “communications information for a communications network *accessible by a second DMA gateway*” requires that “the identified device must be accessible by a DMA server via the second DMA gateway.” Sur-reply 5. We disagree. The claim’s recitation of “a communications network accessible by a second DMA gateway” does not require that a *particular device* must be accessible “via the second DMA gateway.” Instead, this claim phrase recites that the communications information is broadly “for” a communications network, which *communications network* (not the “one or more devices”) is accessible by a second DMA gateway. Flore’s PDP context satisfies the recitation “communications information for a communications network accessible by a second DMA gateway” for reasons we explain in the previous section.

Petitioner also contends that Patent Owner argues a nonexistent claim limitation “that the identified device must be accessible by a DMA server via the second DMA gateway *at the time the communications information*

*is received.*” Reply 16 (citing PO Resp. 37 (“Flore’s PDP context is sent *before* the UE is handed over . . . . At the time the PDP context is sent, the UE is still subscribed to the first network’s AGW 134, and cannot be accessed by SGSN 142 . . . .”)). Petitioner asserts that all the claim requires is receiving communications information “indicating one or more devices accessible by *one* of a DMA *server* and a legacy communications network.” *Id.* In Petitioner’s view, Patent Owner “does not dispute that, at the time the update PDP context message is sent, the UE is accessible by AGW [134], which satisfies the ‘DMA server’ language.” *Id.* (citing PO Resp. 37 (“at the time the PDP context is sent, the UE is still subscribed to the first network’s AGW 134”)). Petitioner adds that Patent Owner also does not dispute that “*after* the handover is complete, the UE is accessible by RNC 124 (also a ‘DMA server’ . . . ) via SGSN 142 (the second DMA gateway).” *Id.*

In the Sur-reply, Patent Owner asserts that “Petitioner’s new theory is directly contradicted by the plain language of the claim which includes a present tense requirement that the UE be ‘*accessible by* one of a DMA server and a legacy communications network.’” Sur-reply 5. Patent Owner argues that we should decline Petitioner’s invitation to rewrite the claims to require “communications information . . . indicating one or more devices *not currently* accessible by one of a DMA server and a legacy communications network.” *Id.* at 5–6.

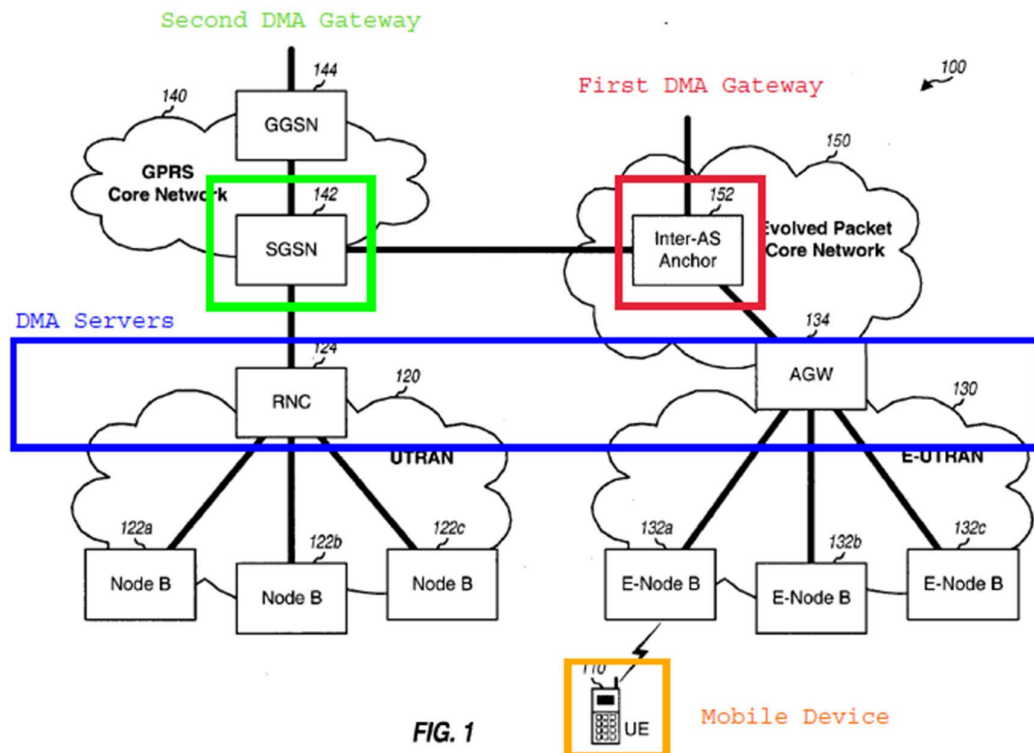
We agree with Petitioner. There is no requirement in claim 1 “that the identified device must be accessible by a DMA server via the second DMA gateway *at the time the communications information is received,*” as Patent Owner implies. *See* Reply 16; PO Resp. 37; Sur-reply 5. Yet regardless of timing, Flore meets the claim. At one point during a call in Flore, the device

is accessible by AGW 134 (a DMA server), and at another point, the device is accessible by SGSN 142 (part of a legacy communications network (network 140)). Flore's PDP context indicates the device's accessibility by AGW 134 or SGSN 142, as the case may be. *See* Ex. 1005 ¶ 46. As Flore explains, "UE 110 may have established a call with E-UTRAN 130 by activating a Packet Data Protocol (PDP) context [the communications information] . . . . *AGW 134 [a DMA server] stores the PDP context for UE 110 during the call.*" *Id.* Flore further explains that AGW 134, "in response to the request from SGSN 142, forwards the PDP context to Inter-AS Anchor 152," thereby disclosing receiving the communications information at the first DMA gateway. *Id.* (emphasis added). Then, "Inter-AS Anchor 152 updates its PDP context fields for UE 110 so that future packets for the UE *are forwarded to SGSN 142* [the second DMA gateway, part of the legacy communications network] instead of AGW 134." *Id.* (emphasis added). The claimed recitation "indicating one of a" permits the prior art to teach indicating either a DMA server or a legacy communications network, yet Flore's PDP context indicates *both*.

Thus, Flore discloses the "communication information indicating one or more devices accessible by one of a DMA server and a legacy communications network" portion of limitation [1b].

*(4) wherein the first DMA gateway and the second DMA gateway participate in a DMA gateway communications network*

For this final portion of limitation [1b], we refer again to Figure 1 of Flore, shown below as annotated by Petitioner:



Petitioner asserts that in Figure 1, SGSN 142 (“second DMA gateway”) and Inter-AS Anchor 152 (“first DMA gateway”) communicate via a “Gn interface,” represented by a line connecting SGSN 142 and Inter-AS Anchor 152. Pet. 14 (citing Ex. 1005 ¶¶ 29, 48). Thus, Petitioner concludes, “SGSN 142 (‘second DMA gateway’) and Inter-AS Anchor 152 (‘first DMA gateway’) ‘participate in a DMA gateway communications network.’” *Id.*

Patent Owner argues that “Petitioner identified the Gn interface as the ‘gateway communications network.’” PO Resp. 35. According to Patent Owner, the claims require that a “network” be used to connect the two DMA

gateways. *Id.* Patent Owner contends, however, that “Petitioners have not identified any **network** in Flore used to connect the DMA gateways.” *Id.*<sup>7</sup>

Petitioner responds that the claim does not require “a ‘network’ be used to connect DMA gateways,” but rather, the “first DMA gateway and the second DMA gateway **participate** in a DMA gateway communications network.” Reply 14. In other words, Petitioner argues, there is no requirement for a network “**between** each DMA gateway, only that each DMA gateway is connected to another **as part of a network.**” *Id.* Petitioner further explains that in Flore, “the Inter-AS Anchor and SGSN are connected via the Gn interface, and form a ‘DMA gateway communications network’ in which each of the SGSN and Inter-AS Anchor participates.” *Id.*

Patent Owner asserts that the Reply shifts Petitioner’s mapping from the Gn interface “**which is a**” “gateway communications network” to the Inter-AS Anchor and SGNS now “**form[ing]**” the claimed network. Sur-reply 25 (citing Pet. 22 (dependent claim 7 argument asserting that “the Gn interface . . . is a ‘gateway communications network’”); Reply 14). Patent Owner contends Petitioner’s Reply argument is new and untimely. *Id.* Patent Owner also reiterates, based on its DMA claim construction, that Flore’s Gn interface is a legacy interface and that Flore’s Inter-AS Anchor and SGSN are not DMA gateways. *Id.* at 25–26.

<sup>7</sup> Patent Owner also contends that “the Gn interface is part of the conventional network architectures that are different from the claimed [DMA] network.” PO Resp. 35. This argument relies on Patent Owner’s flawed construction for DMA, which we have not adopted.

We agree with Petitioner that Patent Owner misreads the claim. Petitioner summarizes our preliminary views on the matter from our Institution Decision:

As Mr. Proctor explains, and as correctly noted by the Board, “because they communicate with each other via a Gn interface, ‘a POSA would have understood that the SGSN [142] (the ‘second DMA gateway’) and Inter-AS Anchor 152 (the ‘first DMA gateway’) participate in a DMA gateway communications network.”

Reply 14 (citing Dec. 22). Based on the full trial record, we reiterate this position, as supported by Mr. Proctor’s credible testimony, as our own.

We also do not view Petitioner as raising an untimely argument in the Reply. The Petition asserts for claim 1 that “SGSN 142 (‘second DMA gateway’) and Inter-AS Anchor 152 (‘first DMA gateway’) ‘participate in a DMA gateway communications network.’” Pet. 14. Patent Owner’s assertion that Petitioner’s sole argument is that the Gn interface “is” a gateway communication network also selectively quotes Petitioner’s dependent claim 7 argument while ignoring Petitioner’s independent claim 1 argument. *See* Sur-reply 25. And Petitioner’s Reply argument that Flore’s components “form” a DMA gateway communications network permissibly elaborates on the Petition’s contention that because Inter-AS Anchor 152 and SGSN 142 “communicate via a Gn interface,” they “participate” in a DMA gateway communications network. *See* Reply 14; *Chamberlain Grp., Inc. v. One World Techs., Inc.*, 944 F. 3d 919, 925 (Fed. Cir. 2019) (“Parties are not barred from elaborating on their arguments on issues previously raised.”).

Patent Owner’s sole argument against the merits of Petitioner’s participation theory is based on Patent Owner’s construction of “DMA,”

which we have not adopted. *See* Sur-reply 25 (“Petitioner’s waived theory also fails on the merits because the Inter-AS Anchor and SGSN are not ‘DMA gateways.’”). Accordingly, Petitioner persuades us that Flore discloses the final portion of limitation [1b]: “wherein the first DMA gateway and the second DMA gateway participate in a DMA gateway communications network.”

Thus, Petitioner persuades us that Flore discloses the entirety of limitation [1b].

*c. [1c] storing the communications information in a home DMA register of the first DMA gateway*

Petitioner contends that Flore discloses this limitation because during handover of UE 110, Flore’s AGW 134 stores the PDP context (the “communications information”) for UE 110 and forwards the PDP context to Inter-AS Anchor 152 (the “first DMA gateway”). Pet. 15 (citing Ex. 1003 ¶¶ 94–98; Ex. 1005 ¶ 46). Petitioner further highlights Flore’s teaching that “Inter-AS Anchor 152 **updates its PDP context fields for UE 110** so that future packets for the UE are forwarded to SGSN 142 instead of AGW 134.” *Id.* (citing Ex. 1005 ¶ 46).

After handover, Inter-AS Anchor 152 acts as a GGSN, which “necessarily contains a location register,” Petitioner contends. *Id.* (citing Ex. 1003 ¶¶ 95–96; Ex. 1005 ¶¶ 39, 46, 50). In support, Petitioner cites to a standards document, which explains that “[t]he location register function in the GGSN stores . . . rout[ing] information . . . for each subscriber for which the GGSN has at least one PDP context active.” *Id.* at 15–16 (citing Ex. 1006, 13–14). Petitioner contends that this location register constitutes a “home DMA register,” which the Inter-AS Anchor includes because it

emulates a GGSN. *Id.* at 16 (citing Ex. 1003 ¶ 96). In sum, Petitioner argues, Flore discloses that the communications information (PDP context) is stored in a home DMA register (GGSN location register) of the first DMA gateway (Inter-AS Anchor). *Id.* at 15–16.

Patent Owner disputes this. PO Resp. 38–40. While Patent Owner acknowledges that Flore’s “PDP context is stored at the GGSN register,” Patent Owner argues that Flore’s GGSN location register is not the claimed “home DMA register.” *Id.* at 38 (citing Ex. 2021 ¶ 97). Patent Owner asserts that “[a]ccording to the ’988 [p]atent, the ‘home DMA register’ stores ‘communications information,’” namely, “home location register (HRL) information” that “indicates devices serviced by networks accessible by the second DMA gateway.” *Id.* (citing Ex. 1001, 3:4–7, 11:10–27, 14:9–11, 15:14–28). Patent Owner then asserts that Flore’s GGSN register is not a home DMA register “because it does not store location register information for its own network *or* any other networks.” *Id.* at 39. Patent Owner thus argues, “Flore does not disclose that the HLR functionality is also located at the GGSN location register.” *Id.* (citing Ex. 2021 ¶ 100).

Petitioner responds, and we agree, that Patent Owner again reads limitations into the claim. Reply 17. That is, the claim does not require “communications information” to include “HRL information” or “location register information for its own or any other networks.” *Id.* Further, Petitioner argues, and we agree, that claim 9 recites HLR data as an alternative to other types of register data, so it would be “illogical and contrary to the doctrine of claim differentiation to require claim 1 to require HLR data.” *Id.* at 18.

Patent Owner asserts in the Sur-reply that it “never argued that the home DMA register must store ‘*HRL*’ data.” Sur-reply 9. But this argument overlooks that Patent Owner did argue “Flore does not disclose that the *HLR functionality* is also located at the GGSN location register.” PO Resp. 38 (emphasis added). Patent Owner also changes tack, arguing that “[n]ot only is the PDP [context] not stored in an HLR [in Flore], but it is also not stored in any *other* location register because it is not location register information,” citing dependent claim 9’s “HRL, VLR, and CLR registers.” Sur-reply 9. This argument is unpersuasive because to the extent Patent Owner reads limitations from dependent claim 9 into claim 1, this is improper. Further, Petitioner persuasively explains that when the Inter-AS Anchor in Flore acts like a GGSN, “[t]he *location register* function in the GGSN stores . . . *routing information* . . . for each subscriber for which the GGSN has at least one *PDP context* active.” Pet. 15–16 (citing Ex. 1006, 13–14). And Flore describes the PDP context as including “routing information.” Ex. 1005 ¶ 46.

Petitioner also relies on another theory, which is that a POSITA would understand that the PDP context fields for UE 110 are a home DMA register of the Inter-AS Anchor because Inter-AS Anchor “necessarily has a list of entries for the UEs it serves, such as UE 110.” Pet. 16 (citing Ex. 1003 ¶ 97). Thus, Petitioner adds, “by updating the PDP Context information with the address of SGSN 142 instead of AGW 134, the Inter-AS Anchor stores the communications information included in the Update PDP Context Response message to its ‘home DMA register.’” *Id.* at 16–17 (citing Ex. 1003 ¶ 97).

To this theory, Patent Owner responds that “the home DMA register, and HLRs more generally, include more than a ‘list of entries for the UEs it serves.’” PO Resp. 39 (citing Ex. 2021 ¶ 101). HLRs store location information for the subscribers it serves, not just their identities, Patent Owner argues. *Id.* at 39–40. Patent Owner further contends that PDP context fields are “categorically different than the location information stored in an HLR/home DMA register.” *Id.* These arguments are unavailing because Patent Owner again reads in nonexisting limitations into the claim, such as “include more than a ‘list of entries for UEs it serves,’” HLRs “store ‘location’ information for the subscribers it serves, not just their identities,” and the like. *See id.*

Under both of its theories, Petitioner articulates persuasive reasoning, supported by record evidence, for why Flore discloses this limitation. We find persuasive Petitioner’s contentions that (1) Inter-AS Anchor acts as a GGSN, which (2) includes a location register that stores routing information for each subscriber that has an active PDP context. Pet. 15–16; Ex. 1003 ¶ 96. As we already explain above, we agree with Petitioner that Flore’s PDP context (including its routing information) constitutes the claimed “communications information.” And, as Petitioner and Mr. Proctor persuasively explain, this communications information is stored in a location register of the GGSN, which acts as a home DMA register. *See* Pet. 15–16 (citing Ex. 1003 ¶¶ 94–98; Ex. 1006, 13–14; Ex. 1005 ¶¶ 39, 46, 50).

We further find persuasive Petitioner’s contention that a POSA would understand that the PDP context fields for UE 110 are a home DMA register of the Inter-AS Anchor because Inter-AS Anchor “necessarily has a list of entries for the UEs it serves, such as UE 110.” Pet. 16 (citing Ex. 1003

¶ 97). It is undisputed that the Inter-AS Anchor “updates its PDP context fields for UE 110,” Ex. 1005 ¶ 46, so we agree with Petitioner that Flore’s updating of PDP context fields would necessarily include a list of entries for UEs, which would thus be a home DMA register. *See* Ex. 1003 ¶ 97.

Petitioner therefore persuades us that Flore discloses limitation [1c].

*d. [1d] receiving a communication at the first DMA gateway for a target device indicated by the communications information to be served by the second DMA gateway*

Petitioner argues that Flore teaches that the Inter-AS Anchor 152 “updates its PDP context fields for UE 110 so that **future packets for the UE are forwarded to SGSN 142 instead of AGW 134.**” Pet. 17 (quoting Ex. 1005 ¶ 46) (emphasis Petitioner’s). Petitioner therefore contends that Flore thus discloses receiving packets (“a communication”) at Inter-AS Anchor 152 (“first DMA gateway”) having the IP address of UE 110 as their destination address (“for a target device indicated by the communication information”). *Id.* (citing Ex. 1003 ¶ 100; Ex. 1005 ¶ 60).

Patent Owner does not dispute this limitation. As we mention above, Patent Owner refers to this limitation in passing when discussing limitation [1b], but this reference to limitation [1d] appears to be in error. PO Resp. 37. To the extent Patent Owner does dispute this limitation, its argument is not adequately explained and is therefore unpersuasive.

We determine that Petitioner shows that Flore teaches limitation [1d].

- e. [1e] routing the communication from the first DMA gateway to the target device by relaying the communication from the first DMA gateway to the second DMA gateway via the DMA gateway communications network*

Petitioner argues that Flore teaches “the Inter-AS Anchor 152 routes packets addressed to UE 110 to SGSN 142 after handover, in accordance with the updated PDP context.” Pet. 17–18 (citing Ex. 1005 ¶¶ 46, 60, Fig. 8; Ex. 1003 ¶¶ 102–105). Flore discloses, for example, that “[t]he Inter-AS Anchor may emulate a GGSN after the handover to the second RAN and may exchange packets for the UE with the SGSN.” Ex. 1005 ¶ 60. Petitioner also argues that Flore teaches that “‘Inter-AS Anchor 152 updates its PDP context fields for UE 110 **so that future packets for the UE are forwarded to SGSN 142** instead of AGW 134.’” Pet. 18 (quoting Ex. 1005 ¶ 46).

Patent Owner does not dispute that Flore discloses this limitation. We agree with Petitioner that Flore discloses limitation [1e].

*f. Summary as to Claim 1*

Based on the foregoing, Petitioner has proven by a preponderance of the evidence that Flore anticipates claim 1.

*3. Dependent claims 3–9 and 20*

Petitioner contends that dependent claims 3–9 and 20 are also anticipated by Flore. Pet. 19–24. Petitioner provides a detailed analysis explaining where Flore discloses the limitations in these dependent claims. Patent Owner does not dispute these assertions, except for claims 7, 9, and 20, which we address below. PO Resp. 40–45.

We have reviewed Petitioner’s contentions and supporting evidence for claims 3–6 and 8 and find them persuasive. Thus, we determine that Petitioner has proven by a preponderance of the evidence that claims 3–6 and 8 are anticipated by Flore.

*a. Dependent Claim 7*

Dependent claim 7 recites, “The method of claim 1, further comprising, upon receiving the communications information, the first DMA gateway automatically sending at least a portion of the communications information to the second DMA gateway via the gateway communications network.”

Petitioner argues that Flore discloses this limitation by teaching that “AGW 134 stores the PDP context for UE 110 during the call and . . . forwards the PDP context to Inter-AS Anchor 152,” the first DMA gateway, which then “forwards the information in an Update PDP Context Response message to SGSN 142,” the second DMA gateway. Pet. 21 (citing Ex. 1003 ¶¶ 116–118; Ex. 1005 ¶ 46). Petitioner adds that this update message is “sent across the Gn interface, which is a ‘gateway communications network.’” *Id.* at 22 (citing Ex. 1003 ¶ 117; Ex. 1005 ¶¶ 29, 40).

Patent Owner raises two arguments for this claim. First, Patent Owner raises a similar argument as for limitation [1b], i.e., that “PDP context messages are sent *before* the handover is complete,” so “it does not identify a UE device accessible via [the] alleged second DMA gateway.” PO Resp. 41. As we explain above, Patent Owner argues that the words “via the second DMA gateway” are not taught by Flore, but these words are not part of the claim. Thus, Patent Owner’s argument is not commensurate with the scope of claims 1 and 7.

Patent Owner's second argument is that "none of the elements in the Update PDP Context Response message indicates the UE device, let alone one accessible via the alleged second DMA gateway." PO Resp. 41 (citing Ex. 2021 ¶ 105). The first part of this argument, that the Update PDP Context Response message does not indicate the UE device, is simply incorrect. Flore discloses that the PDP context "contains . . . the IP address[] of UE 110," and the Inter-AS Anchor "forwards the information"—i.e., including the UE's IP address—"in an Update PDP Context Response message." Ex. 1005 ¶ 46. The second part of Patent Owner's argument refers to "via the alleged second DMA gateway," which is not part of the claim. Thus, Patent Owner's arguments are unavailing.

We agree with Petitioner that Flore teaches this limitation because Petitioner has already established that Flore's PDP context constitutes the claimed "communications information" and because Petitioner and Mr. Proctor further establish that Flore's Inter-AS Anchor 152 (first DMA gateway) "forwards the [PDP context] information in an Update PDP Context Response message to SGSN 142," the second DMA gateway, via the Gn interface. Pet. 21 (citing Ex. 1003 ¶¶ 116–118; Ex. 1005 ¶ 46).

Petitioner therefore has proven by a preponderance of the evidence that Flore anticipates claim 7.

*b. Dependent Claim 9*

Dependent claim 9 recites,

9. The method of claim 1, wherein the communications information includes communications register data including at least one of:

a portion of a community location register;

*a portion of home location register (HLR) data for the communications network; and*

*a portion of visitor location register (VLR) data for the communications network.*

(Emphasis added.) Because claim 9 recites three types of register data disjunctively, Petitioner focuses on showing that one of these, “a portion of home location register (HLR) data for the communications network,” is taught by Flore. Pet. 23–24.

Petitioner asserts that Flore’s PDP context contains the IP address of the Inter-AS Anchor, which is a portion of HLR data for the communications network. *Id.* at 23 (citing Ex. 1003 ¶ 46; Ex. 1003 ¶ 121). Petitioner asserts that the HLR “is the location register to which a mobile subscriber is assigned for record purposes such as subscriber information.” *Id.* (citing Ex. 1006, 13; Ex. 1003 ¶ 121). The PDP context includes the claimed “communications register data including a portion of . . . HLR data for the communications network,” Petitioner argues, because the Inter-AS Anchor is the acting GGSN for the subscriber (the location register for which it is assigned). *Id.* at 23–24 (citing Ex. 1003 ¶ 121).

Patent Owner disputes Petitioner’s reliance on PDP context because it asserts that the HLR does not store the PDP context. PO Resp. 43. Rather, Patent Owner contends, “the PDP context is stored in the GGSN location register,” not the HLR. *Id.* (citing Ex. 1006, 13–14; Ex. 2016, 1; Ex. 2021 ¶¶ 110–111).

Petitioner responds that “just because the PDP context is not stored in the HLR does not mean the PDP [context] cannot store part of [the] HLR data.” Reply 19. Petitioner further argues that Flore’s PDP context includes a portion of the HLR data:

Indeed, Mr. Proctor testified that the HLR “is the location register to which a mobile subscriber is assigned for record purposes, and “because the Inter-AS anchor is the acting GGSN for the subscriber, the PDP context includes . . . ‘communication register data including a portion of’ HLR data,” including routing information, the IP address of the UE, the IP address of the Inter-AS Anchor, and QoS profiles.

*Id.* (citing Ex. 1003 ¶ 121).<sup>8</sup>

Patent Owner responds that Petitioner’s argument that PDP context has overlapping data with HLR “departs from [c]laim 9’s requirement that the data is part of the recited registers, and reinforces the point that because the PDP context is not part of any recited register, it does not ‘store part’ of the register location data of those registers.” Sur-reply 27. Patent Owner adds, “[b]ecause it is undisputed that the PDP context is not location register information, the PDP context does not include ‘a portion of . . . **location register**’ data of the HLR, VLR, and/or CLR registers.” *Id.*

We agree with Petitioner. Claim 9 recites “wherein the communications information includes communications register data including . . . a portion of [HLR] data” and does not require that data to be “part of any recited register” or to “‘store part’ of the register location data of those registers,” as Patent Owner asserts. *See id.* Mr. Proctor testifies, and Patent Owner does not dispute, that Flore’s PDP context includes a portion of HLR data. Ex. 1003 ¶ 121; *see* Sur-reply 27.

<sup>8</sup> Petitioner also argues that the PDP context also includes a portion of VLR data, satisfying the “portion of visitor location register (VLR) data for the communications network” alternative in claim 9. Reply 19. We do not consider this argument, however, because it is a new argument that should have been raised in the Petition. *See* 37 C.F.R. § 42.23(b).

We therefore determine that Petitioner has proven by a preponderance of the evidence that Flore anticipates claim 9.

*c. Dependent Claim 20*

Dependent claim 20 recites, “The method of claim 1, wherein the first DMA gateway receives the communications information from the second DMA gateway.” Petitioner contends that Flore discloses that its handover techniques may be performed in reverse, from the legacy UTRAN network (left half of Figure 1) to the E-UTRAN network (right half of Figure 1). Pet. 24. Specifically, Flore states,

[T]he inter-system handover techniques may also be used for handover from a UTRAN to an E-UTRAN. . . . The message flow in FIG. 4 may be used for handover from the UTRAN to the E-UTRAN, albeit with AGW 134 in procedure 400 being replaced with a source RNC in the UTRAN, Inter-AS Anchor 152 being replaced by the old SGSN, target RNC 124 being replaced by AGW 134, and target SGSN 142 being replaced by Inter-AS Anchor 152.

*Id.* (quoting Ex. 1005 ¶ 53). Petitioner therefore explains that thus,

instead of the AGW sending a PDP context to the Inter-AS Anchor, source RNC sends the PDP context for the UE 110 to the SGSN 142, and subsequently, instead of the Inter-AS Anchor sending the Update PDP Context Response message to SGSN, the SGSN (the “second DMA gateway”) “forwards the information in an Update PDP Context Response message to” Inter-AS Anchor 152 (the “first DMA gateway”).

*Id.* (citing Ex. 1005 ¶ 46; Ex. 1003 ¶ 123).

Patent Owner contends that throughout the Petition, Petitioner argues that Inter-AS Anchor 152 forwards the PDP context to SGSN, but that for claim 20 only, Petitioner turns that theory on its head. PO Resp. 43–44. Patent Owner argues that “Petitioners cannot shift their position here while

also maintaining their original position to facially satisfy the other claims.”  
*Id.* at 44–45.

We agree with Petitioner that Flore discloses claim 20. Petitioner cites persuasively to Flore’s teachings that “[t]he inter-system handover techniques may also be used for handover from a UTRAN to an E-UTRAN,” which is simply the reverse of the main process disclosed in Flore. *See* Pet. 24 (citing Ex. 1005 ¶ 53). Based on the disclosures we reproduce from Flore above, Petitioner and Mr. Proctor persuasively explain that this reverse process in Flore discloses claim 20’s first DMA gateway receiving the communications information from the second DMA gateway. *See id.*; Ex. 1003 ¶ 123. Patent Owner does not engage with this disclosure in Flore, and thus, its argument is unavailing.

We therefore determine that Petitioner has proven by a preponderance of the evidence that Flore anticipates claim 20.

### III. CONCLUSION<sup>9</sup>

In summary:

<sup>9</sup> Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. *See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

| <b>Claim(s)</b> | <b>35<br/>U.S.C.<br/>§</b> | <b>Reference(s)/Basis</b> | <b>Claim(s)<br/>Shown<br/>Unpatentable</b> | <b>Claim(s) Not<br/>Shown<br/>Unpatentable</b> |
|-----------------|----------------------------|---------------------------|--------------------------------------------|------------------------------------------------|
| 1, 3–9, 20      | 102                        | Flore                     | 1, 3–9, 20                                 |                                                |

#### IV. ORDER

It is hereby:

ORDERED that Petitioner has shown by a preponderance of the evidence that claims 1, 3–9, and 20 of the '988 patent are unpatentable;

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

FOR PETITIONER:

Robert N. Kang  
Barry K. Shelton  
WINSTON & STRAWN LLP  
[rkang@winston.com](mailto:rkang@winston.com)  
[bshelton@winston.com](mailto:bshelton@winston.com)

FOR PATENT OWNER:

James Hannah  
Aaron M. Frankel  
Jeffrey H. Price  
Jenna Fuller  
Jeffrey Eng  
KRAMER LEVIN NAFTALIS & FRANKEL LLP  
[jhannah@kramerlevin.com](mailto:jhannah@kramerlevin.com)  
[afrankel@kramerlevin.com](mailto:afrankel@kramerlevin.com)  
[jprice@kramerlevin.com](mailto:jprice@kramerlevin.com)  
[jfuller@kramerlevin.com](mailto:jfuller@kramerlevin.com)  
[jeng@kramerlevin.com](mailto:jeng@kramerlevin.com)

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE OFFICE OF THE DEPUTY UNDER SECRETARY OF  
COMMERCE FOR INTELLECTUAL PROPERTY AND DEPUTY  
DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK  
OFFICE

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MICROSOFT CORPORATION and AFFIRMED NETWORKS, INC.,  
Petitioner,

v.

LEMKO CORP.,  
Patent Owner.

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IPR2023-00529 (Patent 7,653,414 B2)  
IPR2023-00531 (Patent 7,855,988 B2)

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Before DERRICK BRENT,<sup>1</sup> *Deputy Under Secretary of Commerce for  
Intellectual Property and Deputy Director of the United States Patent and  
Trademark Office.*

<sup>1</sup> Katherine K. Vidal, Under Secretary of Commerce for Intellectual Property and Director of the United States Patent and Trademark Office, took no part in this decision. The Director's authority is delegated to Derrick Brent, Deputy Under Secretary of Commerce for Intellectual Property and Deputy Director of the United States Patent and Trademark Office. *See* Director's Memorandum, Procedures for Recusal to Avoid Conflicts of Interest and Delegations of Authority, § II.c (Apr. 20, 2022), available at [www.uspto.gov/sites/default/files/documents/Director-Memorandum-on-Recusal-Procedures.pdf](http://www.uspto.gov/sites/default/files/documents/Director-Memorandum-on-Recusal-Procedures.pdf).

## ORDER

The Office received a request for Director Review of the Decision on Institution in each of the above-captioned cases. *See* Paper 13;<sup>2</sup> Ex. 3100. Director Vidal is recused from these matters, and the requests were referred to me.

Upon consideration of the request, it is:

ORDERED that the requests for Director Review are denied.

<sup>2</sup> Unless otherwise noted, citations are to papers and exhibits in IPR2023-00529.

For PETITIONER:

Robert Kang  
Barry K. Shelton  
WINSTON & STRAWN LLP  
rkang@winston.com  
bshelton@winston.com

For PATENT OWNER:

James Hannah  
Aaron M. Frankel  
Jeffrey H. Price  
Jenna Fuller  
Jeffrey Eng  
KRAMER LEVIN NAFTALIS & FRANKEL LLP  
jhannah@kramerlevin.com  
afrankel@kramerlevin.com  
jprice@kramerlevin.com  
jfuller@kramerlevin.com  
jeng@kramerlevin.com



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(12) **United States Patent**  
**Pan**

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(45) **Date of Patent:** **Dec. 21, 2010**

(54) **SYSTEM, METHOD, AND DEVICE FOR ROUTING CALLS USING A DISTRIBUTED MOBILE ARCHITECTURE**

(75) Inventor: **Shaowei Pan**, Kildeer, IL (US)

(73) Assignee: **Lemko Corporation**, Schaumburg, IL (US)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 249 days.

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(51) **Int. Cl.**  
**H04W 4/00** (2009.01)

(52) **U.S. Cl.** ..... **370/328; 370/401; 370/352**

(58) **Field of Classification Search** ..... None  
See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

|                   |        |                   |         |
|-------------------|--------|-------------------|---------|
| 7,054,322 B2 *    | 5/2006 | D'Annunzio et al. | 370/401 |
| 2002/0009060 A1 * | 1/2002 | Gross             | 370/321 |
| 2003/0048766 A1 * | 3/2003 | D'Annunzio et al. | 370/338 |
| 2005/0091392 A1   | 4/2005 | Gesswein et al.   |         |
| 2006/0098661 A1   | 5/2006 | Pan               |         |
| 2006/0114934 A1 * | 6/2006 | Shin et al.       | 370/466 |

**OTHER PUBLICATIONS**

International Search Report and Written Opinion in corresponding PCT Application No. PCT/US2009/045973 from the International Searching Authority (KR) mailed Jan. 18, 2010, 14 pages.

\* cited by examiner

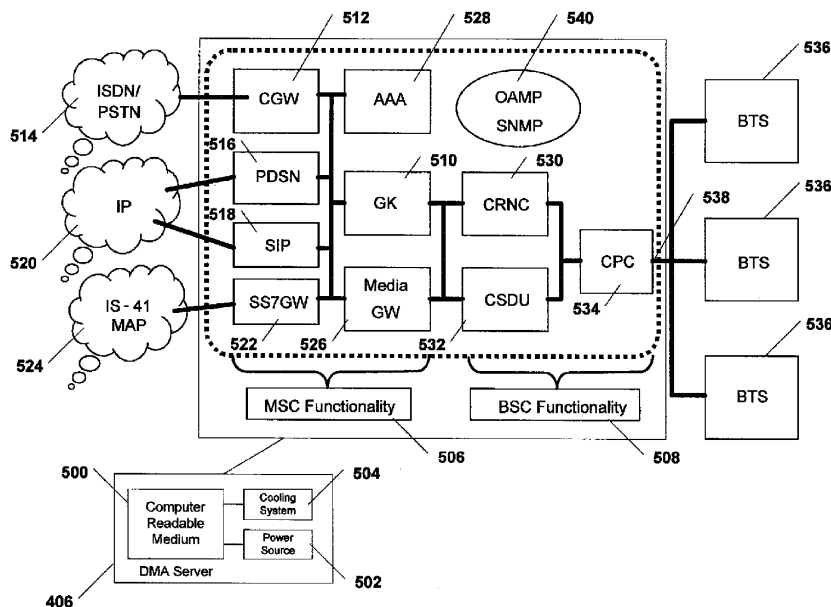
*Primary Examiner*—Bob A Phunkulh

(74) *Attorney, Agent, or Firm*—Toler Law Group, IP

(57) **ABSTRACT**

Methods and devices for routing communications between distributed mobile architecture (DMA) servers using DMA gateways are disclosed. Communications information is received at a first DMA gateway for a communications network accessible by a second DMA gateway. The communications information indicates one or more devices that are accessible by one of a DMA server and a legacy communications network. The first DMA gateway and the second DMA gateway participate in a DMA gateway communications network. The communications information is stored in a home DMA register of the first DMA gateway. A communication is received at the first DMA gateway for a target device indicated by the communications information to be served by the second DMA gateway. The communication is routed from the first DMA gateway to the target device by relaying the communication from the first DMA gateway to the second DMA gateway via the DMA gateway communications network.

**45 Claims, 15 Drawing Sheets**



U.S. Patent

Dec. 21, 2010

Sheet 1 of 15

US 7,855,988 B2

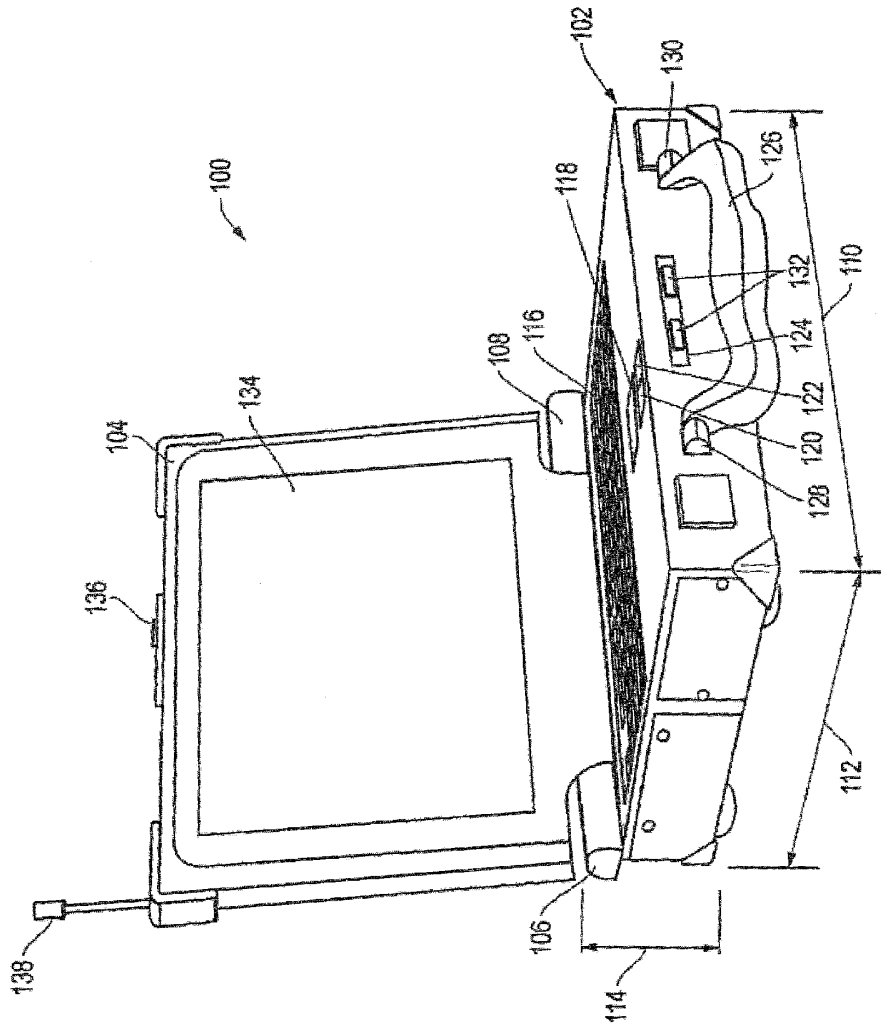


FIG. 1

U.S. Patent

Dec. 21, 2010

Sheet 2 of 15

US 7,855,988 B2

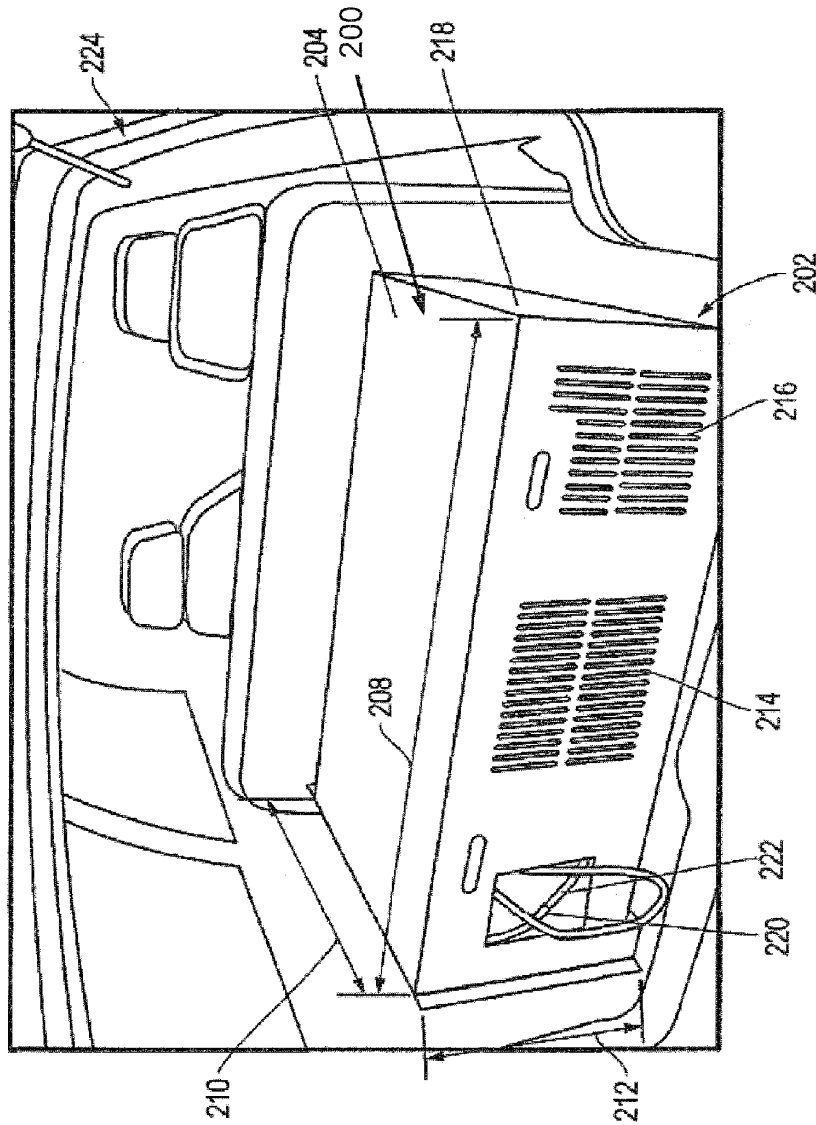


FIG. 2

U.S. Patent

Dec. 21, 2010

Sheet 3 of 15

US 7,855,988 B2

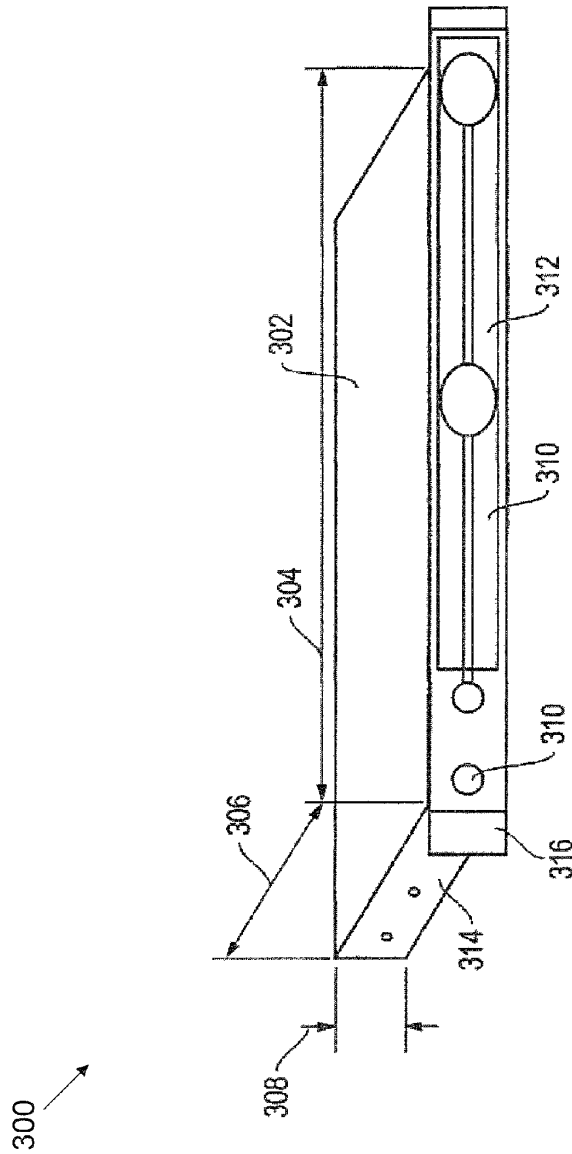
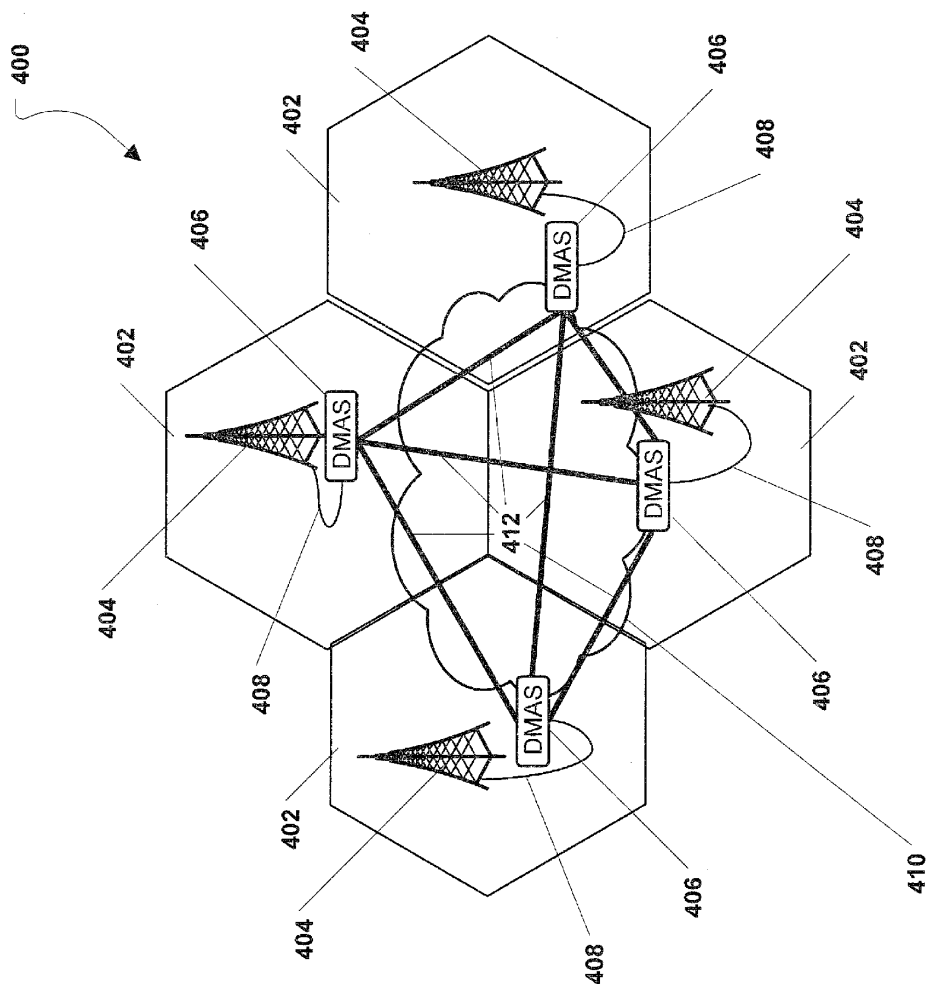


FIG. 3



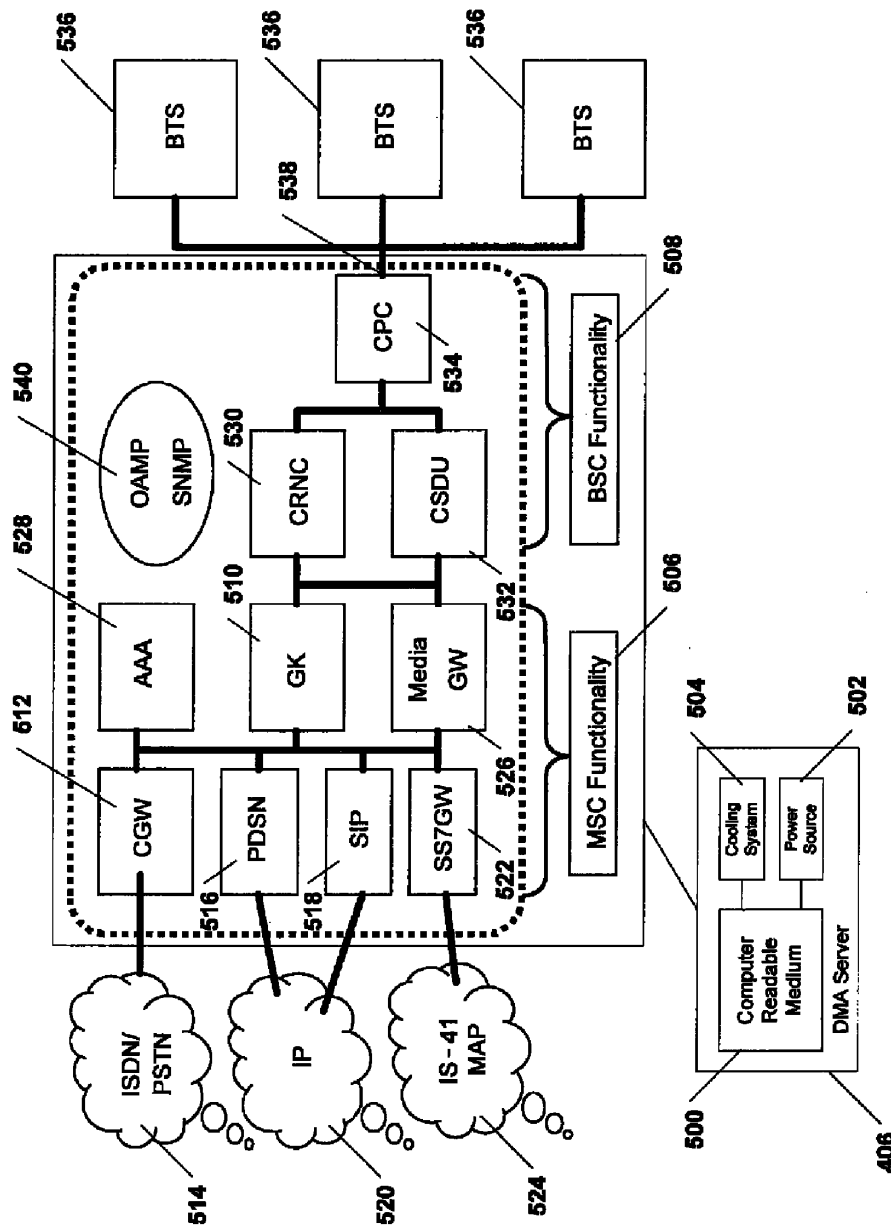


FIG. 5

U.S. Patent

Dec. 21, 2010

Sheet 6 of 15

US 7,855,988 B2

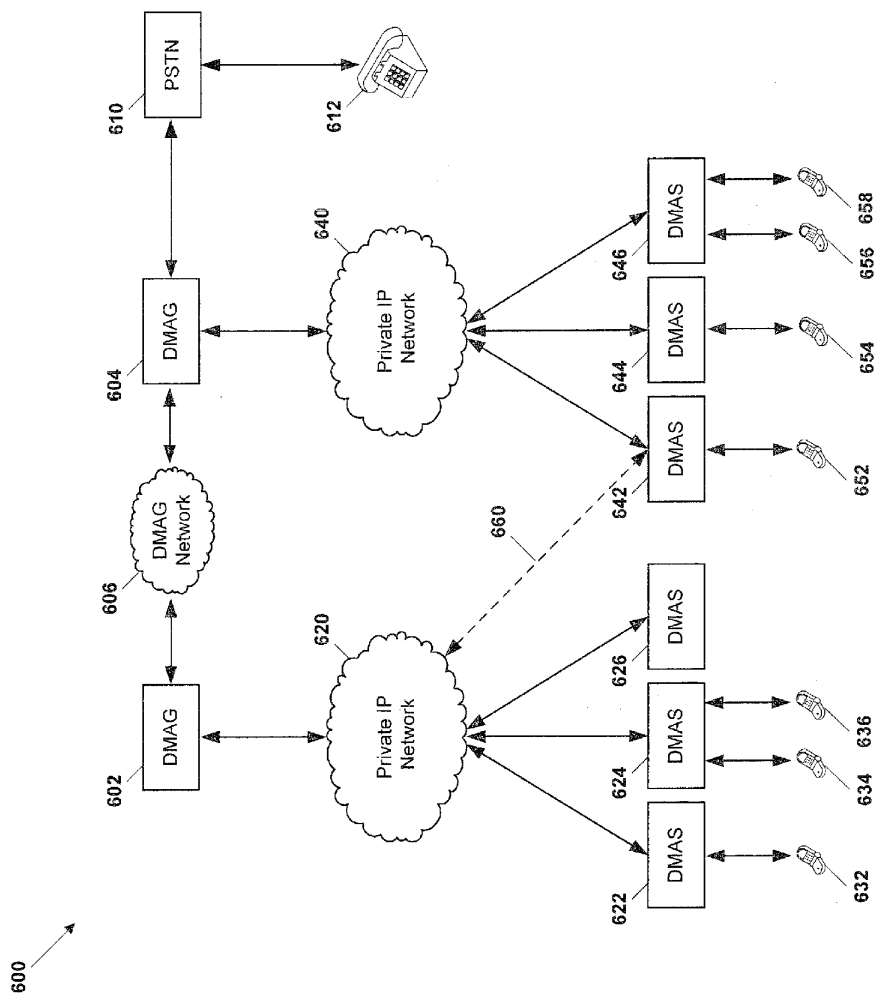


FIG. 6

U.S. Patent

Dec. 21, 2010

Sheet 7 of 15

US 7,855,988 B2

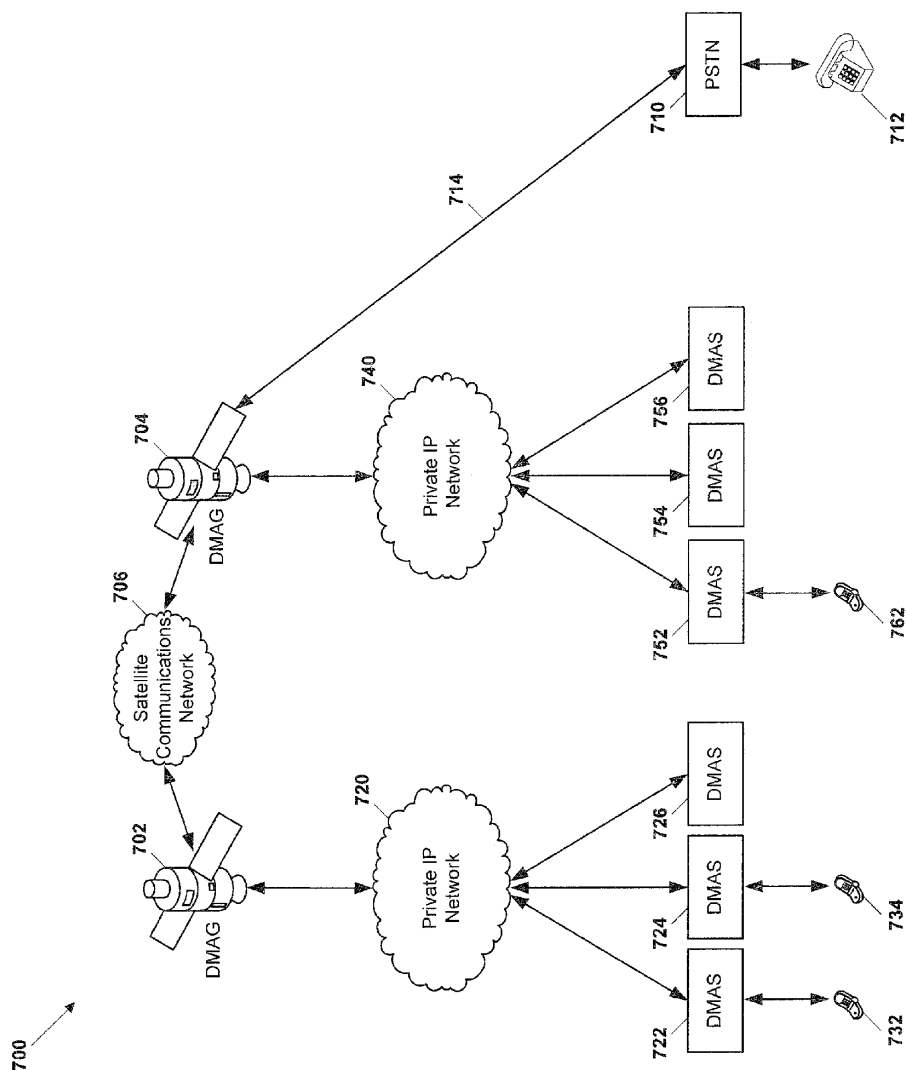


FIG. 7

U.S. Patent

Dec. 21, 2010

Sheet 8 of 15

US 7,855,988 B2

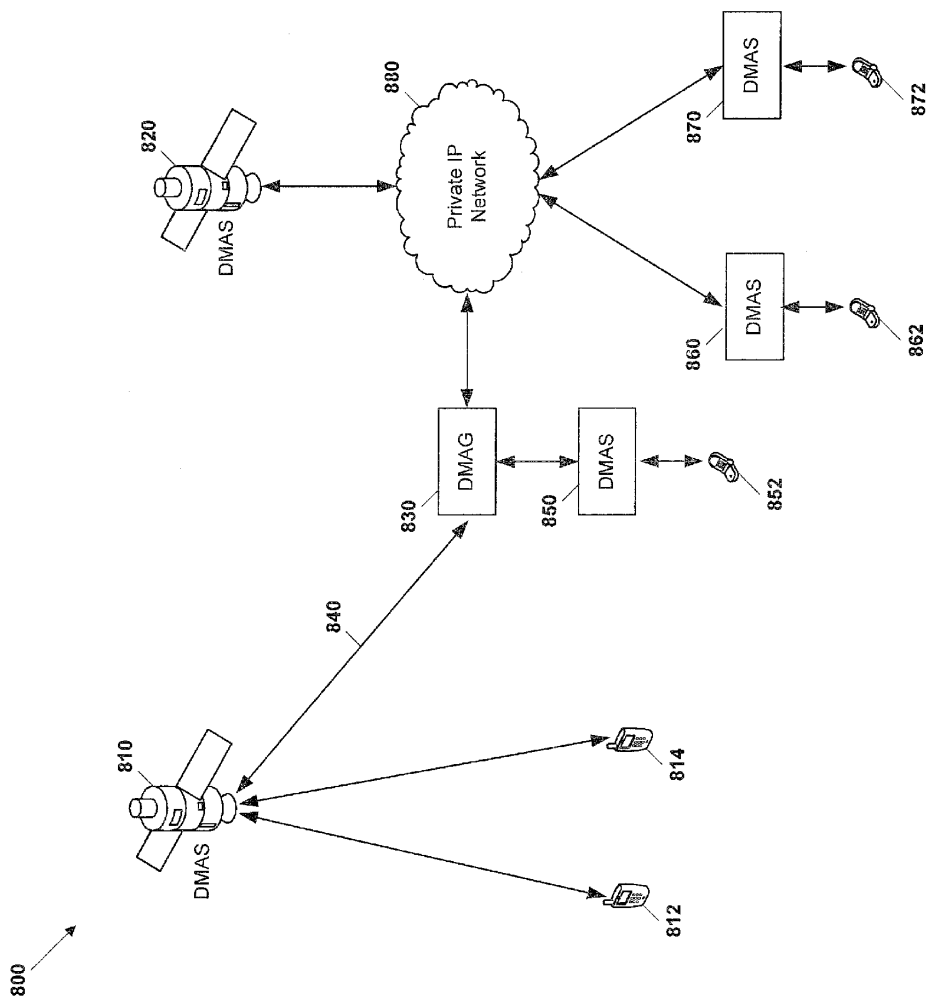


FIG. 8

U.S. Patent

Dec. 21, 2010

Sheet 9 of 15

US 7,855,988 B2

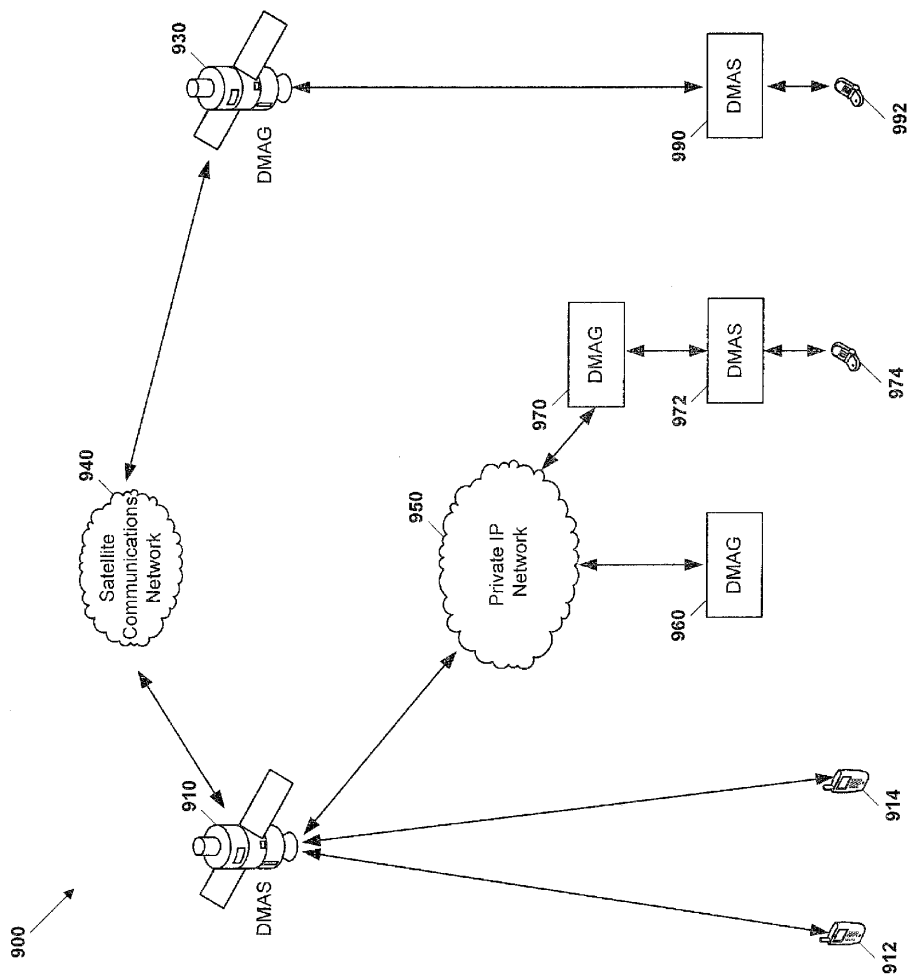


FIG. 9

U.S. Patent

Dec. 21, 2010

Sheet 10 of 15

US 7,855,988 B2

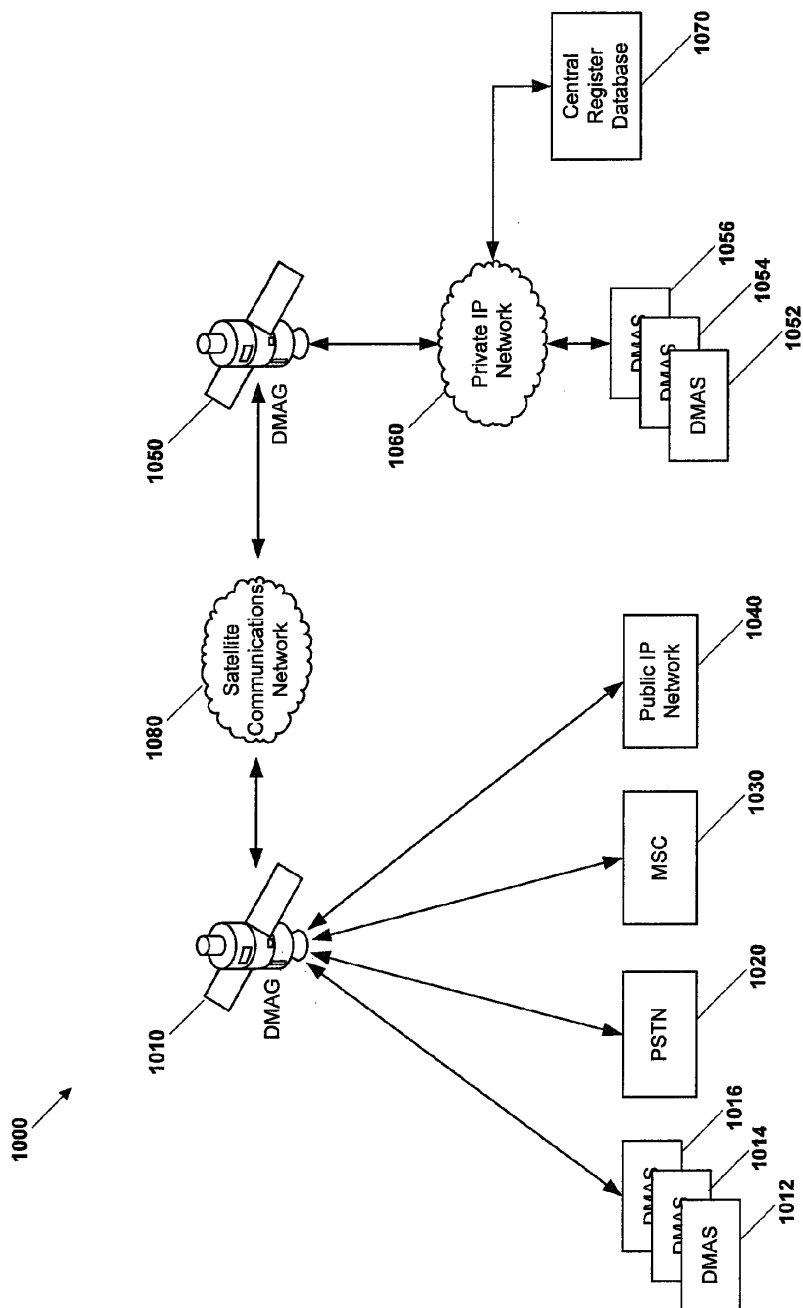


FIG. 10

U.S. Patent

Dec. 21, 2010

Sheet 11 of 15

US 7,855,988 B2

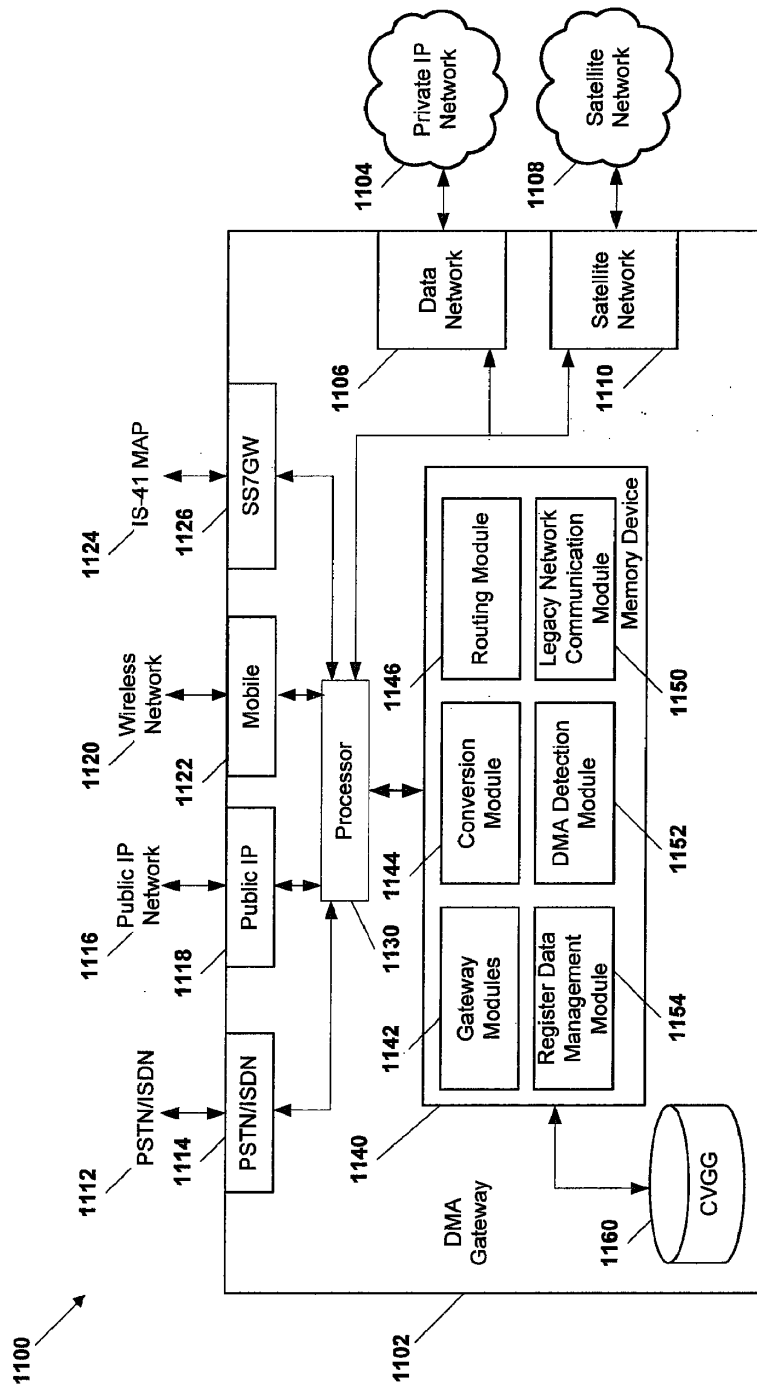


FIG. 11

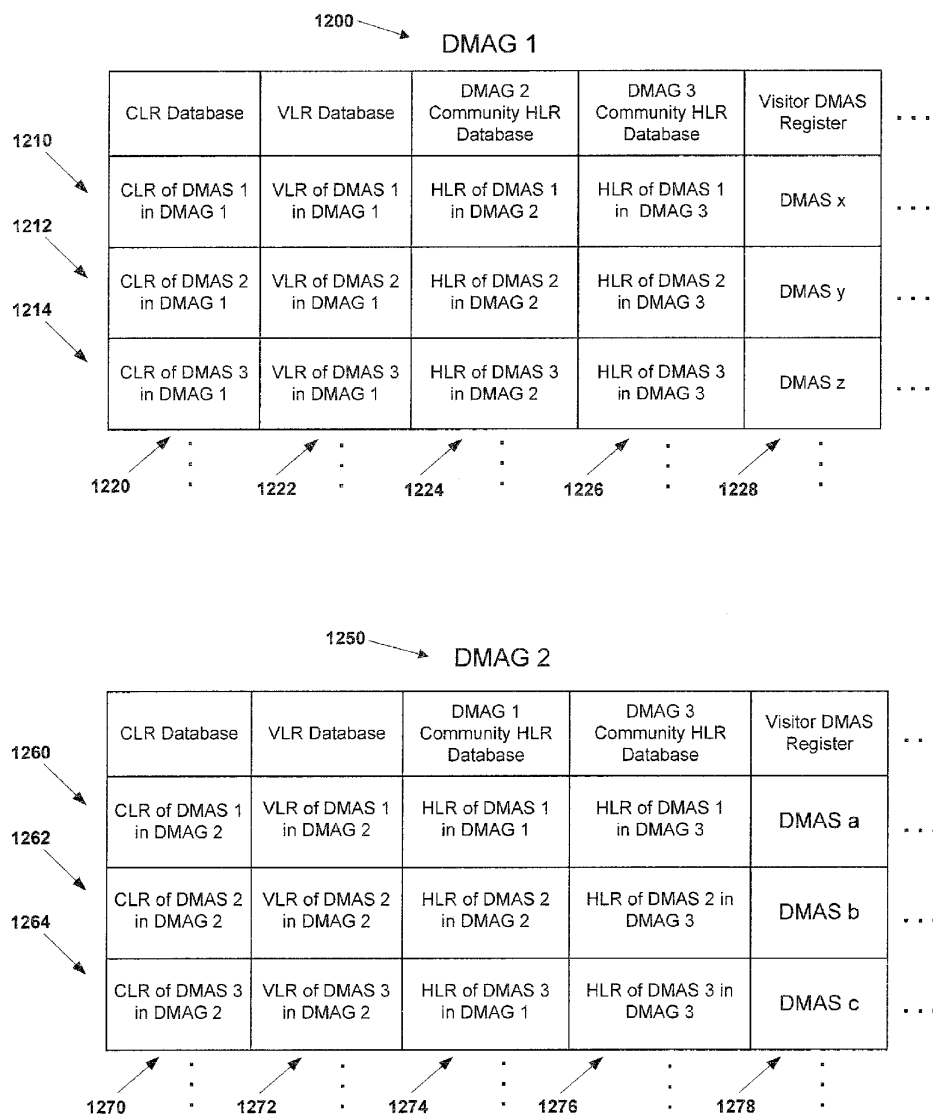


FIG. 12

U.S. Patent

Dec. 21, 2010

Sheet 13 of 15

US 7,855,988 B2

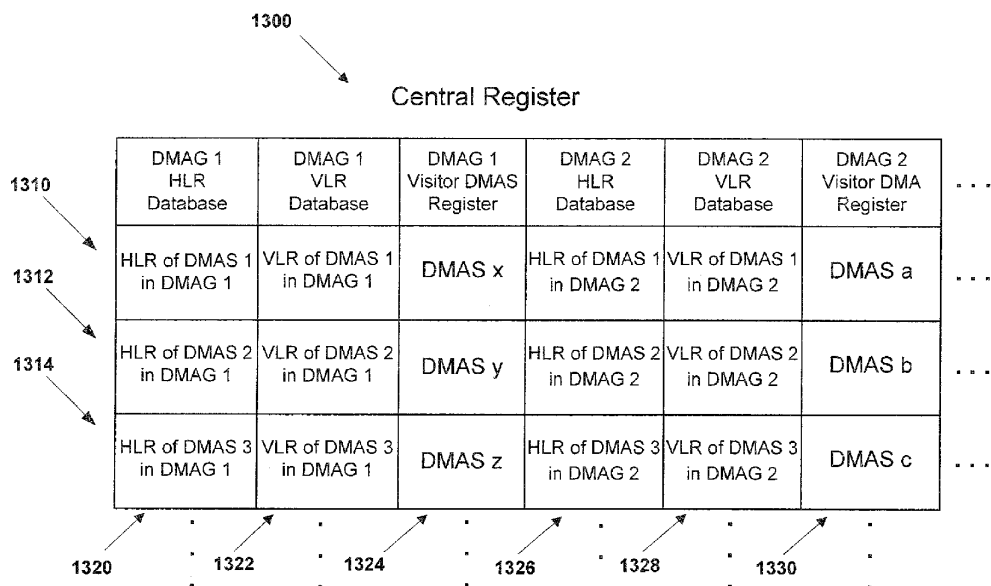


FIG. 13

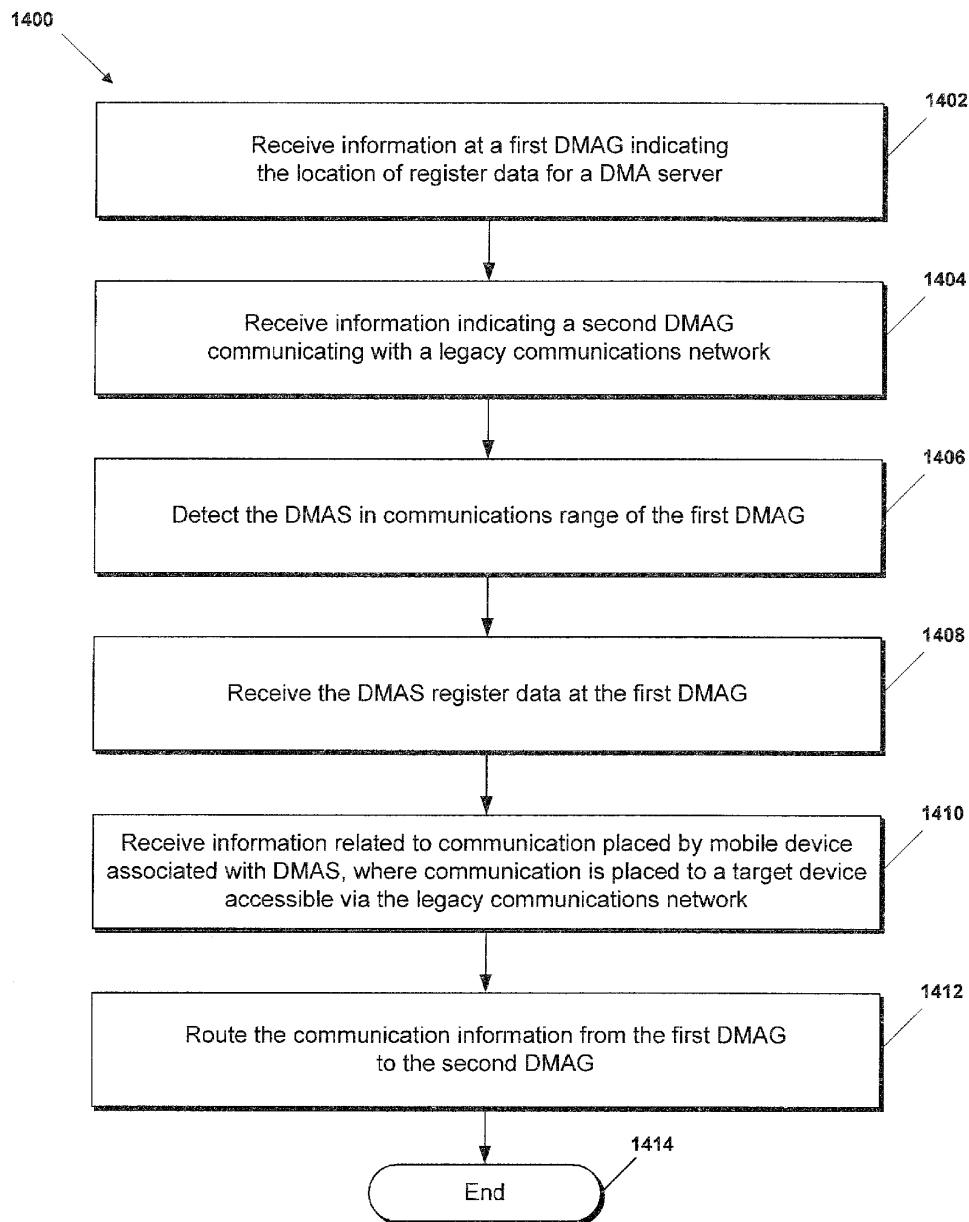


FIG. 14

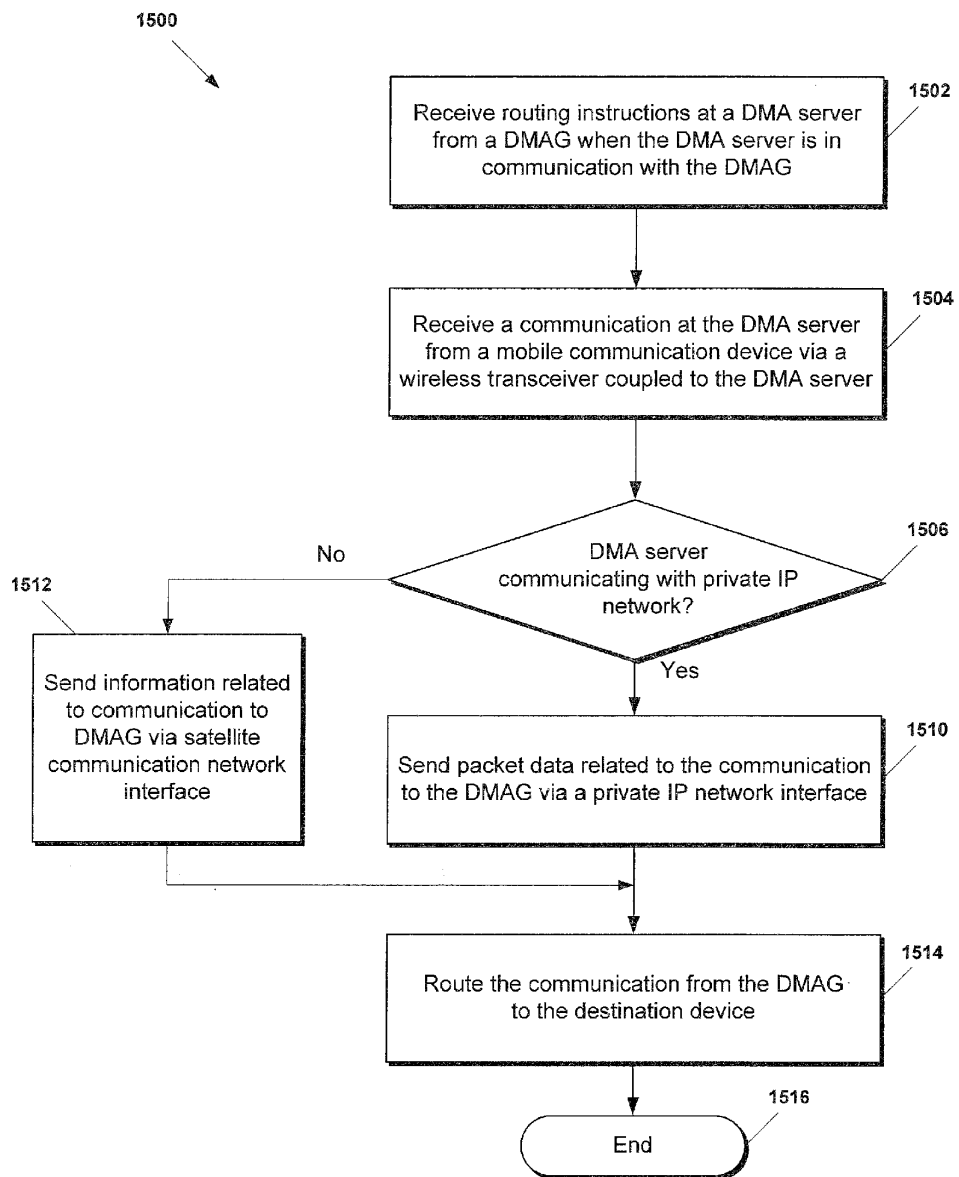


FIG. 15

US 7,855,988 B2

1

# SYSTEM, METHOD, AND DEVICE FOR ROUTING CALLS USING A DISTRIBUTED MOBILE ARCHITECTURE

## FIELD OF THE DISCLOSURE

The present disclosure relates generally to distributed mobile communications systems.

## BACKGROUND

Access to basic telephony service is particularly important for rural and isolated communities. Telephony access allows small-scale enterprises, cooperatives, and farmers to obtain accurate information on fair prices for their products and to access regional and national markets. Access also reduces the cost of transportation and supports the local tourist industry. By bringing markets to people via telecommunications, rather than forcing people to leave in search of markets, urban migration is reduced and greater income and employment potential are generated in rural areas.

Unfortunately, the last decade of the telecommunications boom has not alleviated the disparities between urban and rural communities. The average imbalance, in terms of telephone penetration, in Asia, for example, is over ten to one and is often as high as twenty to one. This means that a country whose urban markets have a penetration of four (4) telephone lines per one-hundred (100) inhabitants, e.g., India and Pakistan, has a rural penetration of less than 0.2 per one-hundred (100). The situation is more acute in most African countries and in some parts of Latin America. By comparison, the disparity in average income level between urban and rural residents in the developing world is usually less than 4 to 1.

Current telephone systems are expensive to deploy. For example, a typical cellular system that includes a mobile switching center (MSC), a base station controller (BSC), and a home location register/visitor location register (HLR/VLR) can cost over \$2.0 million. Moreover, such a system may require a minimum of ten thousand users in order to be economically viable. In many rural areas, the population is not large enough to support the installation of such a system. Further, in many cases, the conditions in which the equipment (e.g., the MSC, BSC, and HLR/VLR) are to be operated are extremely harsh and environmentally prohibitive. An alternative to such a cellular system can include a wired system, but the costs associated with deploying and maintaining land lines are too high for certain rural areas.

In deploying telephone systems in such situations, a further concern is how to expand an existing telephone system or implement a new phone system capable of operating with existing telephone systems. For example, it may be desirable to allow communications with users serviced by existing public switched telephone network (PSTN) services, Voice over Internet Protocol (VoIP) systems, wireless communications systems, and other systems. Providing compatibility between these systems presents a challenge in itself. Moreover, because some of these systems may be deployed in rural or other remote areas, providing a medium through which newly deployed systems can communicate with one another presents a concern.

Accordingly, there exists a need for an improved communications system that is relatively inexpensive to deploy and

2

relatively inexpensive to operate, as well as able to integrate different communications systems.

## BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is pointed out with particularity in the appended claims. However, other features are described in the following detailed description in conjunction with the accompanying drawings in which:

FIG. 1 is a view of a particular illustrative embodiment of a distributed mobile architecture (DMA) server having a first illustrative form factor;

FIG. 2 is a view of another particular illustrative embodiment of an alternative embodiment of a DMA server having a second illustrative form factor;

FIG. 3 is a diagram of another particular illustrative embodiment of an alternative embodiment of a DMA server having a third illustrative form factor;

FIG. 4 is a diagram of a particular illustrative embodiment of a distributed and associative communications system;

FIG. 5 is a block diagram of a particular illustrative embodiment of a DMA server;

FIG. 6 is a diagram of a particular illustrative embodiment of a network incorporating a plurality of DMA gateways linking a plurality of DMA servers and a legacy network;

FIG. 7 is a diagram of a particular illustrative embodiment of a network incorporating a plurality of satellite-based DMA gateways linking a plurality of DMA servers and a legacy network;

FIG. 8 is a diagram of a particular illustrative embodiment of a network incorporating a DMA gateway linking a plurality of satellite-based DMA servers and ground-based DMA servers;

FIG. 9 is a diagram of a particular illustrative embodiment of a network incorporating a plurality of satellite-based and ground-based DMA gateways linking a plurality of satellite-based and ground-based DMA servers;

FIG. 10 is a diagram of a particular illustrative embodiment of a network incorporating a plurality of DMA gateways and a plurality of legacy networks utilizing a central register database for communications devices accessible within the network;

FIG. 11 is a block diagram of a particular illustrative embodiment of a DMA gateway;

FIG. 12 is a diagram of a particular illustrative embodiment of an exemplary data structure used by a DMA gateway for maintaining information about communications devices accessible through other gateways;

FIG. 13 is a diagram of a particular illustrative embodiment of an exemplary structure maintained in a central database accessible by DMA gateways to maintain information about communications devices accessible throughout a network;

FIG. 14 is a flow chart to illustrate a particular illustrative embodiment of the use of information about accessible networks and devices for routing communications between DMA gateways; and

FIG. 15 is a flow chart to illustrate a particular illustrative embodiment of a selective routing of a communication by a DMA gateway via a private Internet Protocol network or a gateway network.

## DETAILED DESCRIPTION OF THE DRAWINGS

Methods and devices for routing communications between distributed mobile architecture (DMA) servers using DMA gateways are disclosed. Communications information is received at a first DMA gateway for a communications net-

US 7,855,988 B2

3

work accessible by a second DMA gateway. The communications information indicates one or more devices that are accessible by one of a DMA server and a legacy communications network. The first DMA gateway and the second DMA gateway participate in a DMA gateway communications network. The communications information is stored in a home DMA register of the first DMA gateway. A communication is received at the first DMA gateway for a target device indicated by the communications information to be served by the second DMA gateway. The communication is routed from the first DMA gateway to the target device by relaying the communication from the first DMA gateway to the second DMA gateway via the DMA gateway communications network.

In a particular embodiment, a first distributed mobile architecture (DMA) gateway includes a number of interfaces. A first interface is adapted to communicate with a legacy communications network. A second interface is adapted to communicate with a private Internet Protocol (IP) network. A third interface is adapted to communicate with a DMA gateway communications network. The gateway also includes a server having logic adapted to receive legacy network information from a second DMA gateway, the legacy network information indicating that the legacy communications network is in a communications range of the second DMA gateway. The DMA gateway forwards information associated with a communication received from a DMA server via the second interface to the second DMA gateway via the third interface. The call is placed to a destination device accessible via the legacy communications network.

In another particular embodiment, first routing instructions at a first distributed mobile architecture (DMA) server from a first DMA gateway when the first DMA server is in a first service area of the first DMA gateway. The first DMA gateway comprises a first orbiting satellite. A first call received at the first DMA server from a first mobile communications device via a wireless transceiver integrated with the first DMA server is sent to the first DMA gateway via a private Internet Protocol (IP) network according to the first routing instructions. The first call is placed to a destination device accessible via a legacy communications network, the legacy communications network accessible via the first DMA gateway.

In another embodiment, a distributed mobile architecture (DMA) server is coupled to a wireless transceiver. The DMA server includes a first interface adapted to communicate with a private Internet Protocol (IP) network and a second interface adapted to communicate with a satellite communications network. The DMA server includes a server having logic adapted to receive a call from a mobile communications device via the wireless transceiver and send call information related to the call to a DMA gateway. The DMA gateway comprises an orbiting satellite. The call is placed to a destination device accessible via a legacy communications network, the legacy communications network accessible via the DMA gateway.

In yet another embodiment, an orbiting satellite includes a first interface adapted to communicate with a legacy communications network and a second interface adapted to communicate with a private Internet Protocol (IP) network. The satellite also includes a server having logic adapted to receive a call via the first interface. The call is placed to a first mobile communications device accessible to a first distributed mobile architecture (DMA) server. The call is then routed to the first DMA server via the second interface, wherein the first DMA server includes a wireless transceiver to communicate with the first mobile communications device.

4

According to the present disclosure, one or more of the communications devices between which a communication, such as a voice communication and/or a data communication, participates in a communications network via a DMA server. A DMA server enables the deployment or expansion of a communications network to, for example, rural areas where remoteness of the area to be served or a relatively small customer base to be served make the installation of a conventional telephone system impractical or otherwise undesirable. As further described below according to embodiments of this disclosure, while one or more DMA servers may communicate with one another over a private IP network, when a private IP network is not available, the DMA servers may communicate through a plurality of DMA gateways that communicate with one another through a gateway communications network. For example, the DMA gateways may be implemented as orbiting satellites that participate in a gateway communications network that includes a satellite communications network.

In introducing the operation of DMA gateways, exemplary embodiments of DMA servers and their operation are described below.

Referring to FIG. 1, a DMA server is shown and is generally designated 100. As illustrated in FIG. 1, the DMA server 100 includes a base 102 and a lid 104. As shown, the lid 104 is attached to the base by a first lid hinge 106 and a second lid hinge 108. In a particular embodiment, the lid 104 can be rotated about the first lid hinge 106 and the second lid hinge 108 between an open position, shown in FIG. 1, and a closed position (not shown) in which the lid 104 overlays the base 102 and the DMA server 100 is essentially shaped like a box or a briefcase.

As indicated in FIG. 1, the base 102 has a length 110, a width 112 and a height 114. FIG. 1 shows that the DMA server 100 includes a keyboard input device 116 that is incorporated in an upper surface of the base 102. Further, the DMA server 100 includes a mouse input device 118 that is also incorporated into the upper surface of the base 102. In a particular embodiment, the mouse input device 118 is a touch mouse input device 118. Additionally, the DMA server 100 includes a left side button 120 and a right side button 122. In a particular embodiment, the left side button 120 can be used to perform left-click functionality associated with the mouse input device 118. Moreover, the right side button 122 can be used to perform right-click functionality associated with the mouse input device 118.

FIG. 1 further indicates that the base 102 of the DMA server 100 is formed with a vent 124 to permit air exchange with the interior of the base 102 of the DMA server 100 and to facilitate cooling of the electronic components of the DMA server 100 housed within the base 102. Moreover, the base 102 of the DMA server 100 includes a handle 126 that is attached to the base 102 via a first handle hinge 128 and a second handle hinge 130. The base 102 also includes a pair of latch engagement notches 132.

As shown in FIG. 1, the lid 104 includes a flat panel display 134 incorporated therein. When the lid 104 is closed, the display 134 is adjacent to the keyboard 116. Moreover, when the lid 104 is closed, the lid 104 and the base 102 cooperate to protect the display 134, the keyboard 116, the mouse 118, and the buttons 120, 122. FIG. 1 also depicts a latch 136 that is incorporated into the lid 104. When the lid 104 is closed, the latch 136 can engage the latch engagement notches 132 in order to lock the lid in the closed position. As depicted in FIG. 1, an antenna 138 is incorporated into the lid 104. The antenna 138 can be extended during operation and retracted when the DMA server 100 is not operating.

US 7,855,988 B2

5

In a particular embodiment, the length **110** of the base **102** is 31.0 centimeters. Further, in a particular embodiment, the width **112** of the base **102** is 25.5 centimeters. Additionally, in a particular embodiment, the height **114** of the base **102** with the lid **104** in the closed position is 7.0 centimeters. Accordingly, the DMA server **100** has a total volume of 5,533.5 centimeters cubed and a footprint area of 790.5 centimeters squared. Further, in a particular embodiment, the DMA server **100** weighs approximately 5.8 kilograms (kg). As such, in a particular embodiment, the DMA server **100** has a total volume that is less than 6,000 centimeters cubed, a footprint area that is less than 800 centimeters squared, and a weight that is less than 6.0 kilograms.

In a particular embodiment, the DMA server **100** is relatively rugged. Particularly, the DMA server **100** is operable in a temperature range from negative twenty degrees Celsius to positive fifty-five degrees Celsius ( $-20^{\circ}\text{C}$ . to  $55^{\circ}\text{C}$ .). Also, the DMA server **100** is substantially shock resistant and can withstand a one meter drop. Further, the DMA server **100** is substantially weather resistant, substantially dust resistant, and substantially sand resistant. The DMA server **100** is portable and it can be mounted in a vehicle or carried like a brief case. Further, multiple DMA servers **100** can be deployed as described herein.

FIG. 2 depicts an alternative embodiment of a distributed mobile architecture (DMA) server that is generally designated **200**. As shown in FIG. 2, the DMA server **200** includes a base **202** and a lid **204** that is coupled to the base **202** via a plurality of fasteners (not shown). Additionally, the DMA server **200** has a length **208**, a width **210**, and a height **212**. Further, the base **202** of the DMA server **200** includes a first vent **214**, a second vent **216**, and a third vent **218**. In a particular embodiment, the vents **214**, **216**, **218** permit air exchange with the interior of the base **202** of the DMA server **200** and facilitate cooling of the electronic components of the DMA server **200** housed within the base **202**. As shown in FIG. 2, the DMA server **200** includes an access window **220**. One or more interfaces **222**, e.g., wires can be accessed via the access window **220** and coupled to a base transceiver station (BTS) during deployment of the DMA server **200**. As shown in FIG. 2, the DMA server **200** can be mounted within a vehicle **224**. Further, multiple DMA servers **200** can be deployed as described herein.

In a particular embodiment, the length **208** of the base **202** is 92.0 centimeters. Further, in a particular embodiment, the width **210** of the base **202** is 45.0 centimeters. Additionally, in a particular embodiment, the height **212** of the base **202** is 34.0 centimeters. Accordingly, the DMA server **200** has a total volume of approximately 140,760 centimeters cubed and a footprint area of approximately 4,140 centimeters squared. Further, in a particular embodiment, the DMA server **200** weighs approximately 48 kilograms (kg). As such, in a particular embodiment, the DMA server **100** has a total volume that is less than 150,000 centimeters cubed, a footprint area that is less than 5,000 centimeters squared, and a weight that is less than 50.0 kilograms.

FIG. 3 illustrates another alternative embodiment of a distributed mobile architecture (DMA) server that is generally designated **300**. As depicted in FIG. 3, the DMA server **300** includes a housing **302** that has a length **304**, a width **306**, and a height **308**. Additionally, the housing **302** can be formed with a first vent **310** and a second vent **312**. In a particular embodiment, the vents **310**, **312** permit air exchange with the interior of the housing **302** of the DMA server **300** and facilitate cooling of the electronic components of the DMA server **300** within the housing **302**.

6

As shown in FIG. 3, at least one side of the housing **302** is formed with a rib **314** to enable the DMA server **300** to be slid into a server rack (not shown). Further, the DMA server **300** includes a clip **316** that is coupled to the housing **302** via a fastener, e.g., a bolt. The clip **316** can be engaged with a server rack (not shown) to prevent the DMA server **300** from unintentionally sliding out of the server rack (not shown).

In a particular embodiment, the length **304** of the housing **302** is approximately 76.2 centimeters. Further, in a particular embodiment, the width **306** of the housing **302** is approximately 48.2 centimeters. Additionally, in a particular embodiment, the height **308** of the housing **302** is approximately 4.3 centimeters. Accordingly, the DMA server **300** has a total volume of approximately 15,756.5 centimeters cubed and a footprint area of approximately 3,672.9 centimeters squared. Further, in a particular embodiment, the DMA server **300** weighs approximately 17.7 kilograms (kg). Also, in a particular embodiment, the DMA server **300** is stackable in order to support various capacity requirements. As such, in a particular embodiment, the DMA server **100** has a total volume that is less than 16,000 centimeters cubed, a footprint area that is less than 4,000 centimeters squared, and a weight that is less than 20.0 kilograms.

The description of embodiments of DMA servers with reference to FIGS. 1-3 are provided for illustration, not limitation. DMA servers also may be embodied in any other suitable form. For example, as described further below, a DMA server may be incorporated within an orbiting satellite that communicates with DMA gateways and other devices via satellite and ground-based communication networks.

FIG. 4 illustrates a non-limiting, exemplary embodiment of a distributive and associated telecommunications system generally designated **400**. As depicted in FIG. 4, the system **400** includes four cellular coverage sites **402**. Each coverage site **402** includes an antenna **404**. In one embodiment, the antenna **404** is connected to a transceiver belonging to a base transceiver station (BTS) and the BTS is a 3-sector BTS. FIG. 4 also indicates that a distributed mobile architecture (DMA) server **406** (abbreviated in FIG. 4 and figures as "DMAS") can be connected to each antenna **404**. In one embodiment, each DMA server **406** is physically and directly connected to its respective antenna **404**, e.g., by a wire or cable **408**. Further, in an illustrative embodiment, the DMA servers **406** can be any of the DMA servers shown in FIG. 1, FIG. 2, and FIG. 3.

As illustrated in FIG. 4, each DMA server **406** is interconnected with the other DMA servers **406** via an Internet protocol network **410**. As such, there exists a peer-to-peer connection **412** between each DMA server **406** in the system **400**. As described in detail below, the DMA servers **406** can handle telephony traffic that is communicated at each antenna **404**. For example, the DMA servers **406** can switch and route calls received via each antenna **404**. Additionally, the DMA servers **406** can hand-off calls to each other as mobile communications devices move around and between the cellular coverage sites **402**. The DMA servers **406** can communicate with each other via the IP network **410** and can further transmit calls to each other via the IP network **410**. It should be understood that more than four cellular coverage sites **402** can be included in the system and that the inclusion of only four cellular coverage sites **402** in FIG. 4 is merely for clarity and explanation purposes.

Within the distributed and associative telecommunications system **400** the controlling logic can be distributed and decentralized. Moreover, the wireless coverage provided by the disclosed system **400** is self-healing and redundant. In other words, due to the interconnectivity via the IP network **410**, if

US 7,855,988 B2

7

one or more of the DMA servers **406** loses powers, fails, or is otherwise inoperable, telephony traffic handled by the inoperable DMA server **406** can re-routed to one of the remaining operable DMA servers **406**. Additionally, user data stored in a database, e.g., a home locator resource (HLR) or a visitor locator resource (VLR), can be distributed equally and fully among all of the DMA servers **406**. It can also be appreciated that new cellular coverage sites can be easily added to the system **400** as the demand for users increases. Specifically, a DMA server can be deployed as described below, connected to an antenna, connected to the IP network, and activated to provide cellular coverage in a new area.

FIG. 5 shows an exemplary, non-limiting, detailed embodiment of a DMA server, e.g., one of the DMA servers **406** described in conjunction with FIG. 4. Further, any of the DMA servers **100**, **200**, **300** shown in FIG. 1, FIG. 2, and FIG. 3 can include the components depicted in FIG. 5 and described herein.

In a particular embodiment, the DMA server **406** is essentially a processor, or computer, having a housing and a computer readable medium **500** that is disposed therein. A power supply **502** can also be disposed within the housing of the DMA server **406** in order to provide power to the DMA server **406**. The power supply **502** can be a rechargeable battery disposed within the DMA server **406** or it can be external to the DMA server **406**, i.e., a standard power outlet. Moreover, a cooling system **504**, e.g., a fan with a thermostat, can be within the DMA server **406** in order to keep the DMA server **406** from overheating. In an alternative embodiment, the DMA server **406** can be a single board processor that does not require a fan.

As depicted in FIG. 5, the DMA server **406** may include a mobile switching center (MSC) module **506** and a base station controller (BSC) module **508** embedded within the computer readable medium **500**. In an exemplary, non-limiting embodiment, the MSC module **506** can include a gatekeeper (GK) **510** that is connected to several gateways. For example, a circuit gateway (CGW) **512** can be connected to the GK **510** and can provide connectivity to an integrated services digital network/public switched telephone network (ISDN/PSTN) interface **514**. The CGW **512** can provide a circuit switched to packet data conversion. In an exemplary, non-limiting embodiment, the PSTN portion of the ISDN/PSTN interface **514** can be an inter-office interface that uses the Bellcore industry standard ISDN user part (ISUP) signaling on a signaling system seven (SS7) link set. Moreover, the voice trunks on this interface can be timeslots on a T1 connection. Inbound and outbound voice calls can be supported on the ISDN portion of the ISDN/PSTN interface **514**.

As further illustrated in FIG. 5, a packet data server node (PDSN) gateway **516** for CDMA, or a Gateway GPRS Support Node (GGSN) for Global System for Mobile Communication (GSM), and a Session Initiation Protocol (SIP) gateway **518** can also be connected to the GK **510**. The PDSN gateway **516** and the SIP gateway **518** can provide connectivity to an IP interface **520**. Further, the PDSN gateway **516** or a GGSN can establish a reverse tunnel with the PDSN or GGSN gateway **516** using generic routing encapsulation (GRE). Moreover, the PDSN gateway **516**, or GGSN, can implement the Pseudo Random Function (PRF)/Foreign Agent (FA) functionality of the DMA server **406** which supports mobile IP functions.

FIG. 5 further shows an SS7 gateway **522** that provides connectivity to an American National Standards Institute 41 (ANSI-41) and GSM Mobile Application Part (MAP) interface **524**. In a particular embodiment, the ANSI-41 interface can be an SS7 TCAP/SCCP interface on the same SS7 link set

8

used for ISUP signaling. The same SS7 point code can be used to identify the DMA server **406** in the ANSI-41 network. The ANSI-41 interface can be used for roamer registration. Further, in an exemplary, non-limiting embodiment, the GSM MAP interface can be an SS7 TCAP/SCCP interface on the same SS7 link set used for ISUP signaling. It can be appreciated that there are different protocols of MAP from MAP/B to MAP/I, but in the illustrative embodiment, the different MAP/x protocols are not stacked—they are used independently. As described with reference to FIG. 11, the SS7 interface may be included in either the DMA server **406** or the DMA gateway **1102**.

As depicted in FIG. 5, a media gateway **526** can also be coupled to the GK **510**. In an exemplary, non-limiting embodiment, the media gateway **526** can include cellular transcoders, one or more intranet gateways, conferencing bridges, and group calling functionality. Further, an authentication, authorization, and accounting (AAA) module **528** can be coupled to the GK **510**. In an exemplary, non-limiting embodiment, there are three levels of authentication management. The highest level is for administration, the mid-level is for operations, and the lowest level is for normal users. The functions of the AAA module **528** can be included in the user level.

In an exemplary, non-limiting embodiment, the GK **510** can act as an AAA server and a feather server to support advanced supplementary service, short message service, etc. Moreover, the GK **510** can act as a call manager and can support ISUP and PSTN function calls. Additionally, the GK **510** can act as a signal gateway, e.g., IP to SS7 inter-working, ISUP, GSM MAP or ANSI-41 to PSTN and ANSI-42/GSM. The GK **510** can also function as a data call server.

As illustrated in FIG. 5, the BSC module **508** includes a cellular radio network controller (CRNC) **530** and a cellular selection/distribution unit (CSDU) **532** that are connected to a call protocol controller (CPC) **534**. In turn, the CPC **534** can be connected to a plurality of base transceiver stations (BTSs) **536**. Specifically, the DMA server **406** includes a BTS interface **538** at the CPC **534** that can be physically and directly connected to the BTSs **536**. The CRNC **530** can provide cellular radio resource management and cellular call control. The CSDU **532** can provide Fundamental Channel (FCH) soft handoff and distribution, Link Access Control (LAC) processing for inband signaling, multiplexer (MUX) functions, and centralized power control. Further, the CPC **534** can convert a T1 or E1 message or ATM interface to a data packet message. In a particular embodiment, each BTS **536** supports signals and traffic up to the front point of the CPC **534**, e.g., up to the BTS interface **538**. Further, in a particular embodiment, the CRNC **530**, the CPC **534**, the CSDU **532** and the OAMP **540** can perform one or more of the functions of legacy Base Station Controllers (BSC).

In an exemplary, non-limiting embodiment, the BTS interface **538** can be an IS-95A OR IS-2000 interface over E1 or ATM, or the BTS interface **538** can be a GSM BTS interface using MAP or customized application for mobile network enhanced logic (CAMEL). In an illustrative embodiment, the CPC **534** can be connected to one or more BTSs **536**. FIG. 5 further shows that the BSC module **508** includes an operations, administration, maintenance, and provisioning (OAMP) module **540**. In an exemplary, non-limiting embodiment, the OAMP module **540** can use simple network management protocol (SNMP) for operations interfaces. Further, the OAMP module **540** can include a JAVA user interface. The OAMP module **540** can also include a software agent that is assigned to each component within the DMA server **406**.

US 7,855,988 B2

9

The agents independently monitor their respective components. Moreover, each agent can provision its respective component.

When deployed in a network, such as illustrated in FIG. 4, embodiments of DMA servers are configured to handle the handing off of communications when, for example, a mobile device passes from a coverage site 402 (FIG. 4) covered serviced by one DMA server 406 to another coverage site 402 serviced by another DMA server 406. As previously described, the DMA servers 406 participate in an IP network 410 through which the communications are routed between the DMA servers 406. However, in not all cases will the DMA servers 406 be able to participate as peers in an IP network 410. For example, if one or more of the coverage sites 402 are in rural locations or other locations remote from other coverage sites 402, there may not be access to the IP network 410 in the remote coverage sites 402. Accordingly, embodiments of the present disclosure describe DMA gateways to enable DMA servers to communicate with one another when one or more of the DMA servers cannot participate directly in the IP network. In addition, embodiments of the DMA gateways also enable legacy networks and devices participating in the legacy networks to communicate with devices serviced by one or more of the DMA servers as further described below.

Because of the mobility of various forms of the DMA servers and devices that may communicate via these servers, as well as the DMA gateways described below, the communications network accounts for the movement of these devices. In other words, as the devices move, information regarding the accessibility of these devices and how communications are routed among them is dynamic. Thus, even when such devices move during the course of a communication, information pertaining to the routing of the communication is updated to support continuation of the communication.

FIG. 6 illustrates a network 600 that includes a first DMA gateway (abbreviated as "DMAG" in FIG. 6 and other figures) 602 and a second DMA gateway 604 that communicate with each other over a DMA gateway network 606. The DMA gateway network 606 may include a dedicated wired or wireless communication medium or be included within a network carrying other communications. The second DMA gateway 604 communicates with a legacy network that, for example, includes a public switched telephone network 610 that services communication with wired, landline devices such as landline telephone 612. The DMA gateway also may enable communication with public IP networks that enable data communications, Voice over Internet Protocol (VoIP) communications, and other communications, as well as other types of legacy networks. Although a pair of DMA gateways 602 and 604 and a single legacy network 610 are shown in FIG. 6, any number of DMA gateways and legacy networks may participate in the network 600.

In addition to the DMA gateways 602 and 604 and the legacy network 610, the network 600 includes two groups of DMA servers in which the DMA servers communicate with each other over separate private IP networks. For example, in a first group communicating via a first private IP network 620, three DMA servers 622, 624, and 626 communicate with each other. In a second group communicating via a second private IP network 640, three DMA servers 642, 644, and 646 communicate with each other. Two different groups each including three DMA servers are shown for illustration. However, it will be appreciated that any number of groups of DMA servers could communicate with each other within each of the groups, and any number of groups could be bridged using

10

DMA gateways as described below to enable communications between devices associated with different DMA servers in different groups.

Each of the DMA servers may service a plurality of voice and/or data communications devices. For example, a first DMA server 622, through an associated wireless transceiver, may service a plurality of communications devices such as a first wireless telephone device 632. As previously described with reference to FIG. 4, the first wireless telephone device 632 may communicate with devices serviced by other DMA servers that participate in the first private IP network 620. Thus, for example, the first wireless telephone device 632 would be able to engage in voice and/or data communications with a second wireless telephone device 634 serviced by a second DMA server 624. Also, it should be appreciated that the second wireless telephone device may communicate with other devices, such as a third wireless telephone device 636 that is serviced by a same DMA server, such as the second DMA server 624. Although the DMA servers in FIG. 6 are only shown servicing wireless telephone devices, it should be appreciated that other devices, such as computers and other communication devices also may participate in the network 600 by communicating through the DMA servers.

As shown in FIG. 6, the groups of DMA servers communicating via the two private IP networks 620 and 640 are separate networks. The wireless telephone devices 632, 634, and 636 serviced by DMA servers 622 and 624 participating in the first private IP network 620 do not have a network connection with any of the DMA servers 642, 644, and 646 that communicate with each other via the second private IP network. Thus, a fourth wireless telephone device 652 in communication with a fourth DMA server 642 can communicate with a fifth wireless telephone device 654 serviced by a fifth DMA server 644 because the DMA servers 642 and 644 can communicate with each other via the second private IP network 640. Similarly, the sixth wireless telephone device 656 and the seventh wireless telephone device 658 can communicate with each other through the sixth DMA server 646 with which each communicates and each can communicate with the other wireless telephone devices 652 and 654 serviced by the other DMA servers 642 and 644 participating in the second private IP network. However, without a bridge between the first private IP network 620 and the second private IP network 640, neither the DMA servers nor the wireless telephone devices serviced by each of the private IP networks 620 and 640 can communicate with devices serviced by the other private IP network. Similarly, neither the DMA servers nor the wireless telephone devices serviced by each of the private IP network 620 and 640 can communicate with the public switched telephone network 610 or any of the devices, such as the landline telephone device 612, serviced by the public switched telephone network 610.

Embodiments of the present disclosure enable devices on separate networks to communicate with each other via DMA gateways that bridge separate network and communications systems. In the example of FIG. 6, the first private IP network 620 communicates with the first DMA gateway 602 and the second private IP network 640 communicates with the second DMA gateway 604. The DMA gateways 602 and 604 are configured to route communications from one private IP network to another and the DMA gateways 602 and 604 are in communication with each other via the DMA gateway network 606. As a result, the DMA gateways 602 and 604 can route communications from the DMA servers 622, 624, and 626 and the devices they service to the DMA servers 642, 644, and 646 and the devices they service and vice versa. Also, because the second DMA gateway is coupled with the second

US 7,855,988 B2

11

public switched telephone network **640**, the wireless telephone devices **652**, **654**, **656**, and **658** and other devices serviced by the DMA servers **642**, **644**, and **646** can communicate with the landline telephone device **612** and other devices serviced by the public switched telephone network **610**. In short, the DMA gateways can provide communications between wireless devices serviced by associated DMA servers and wired or wireless devices serviced by legacy networks coupled with the DMA gateways.

To facilitate communications between devices serviced by different networks, the DMA gateways **602** and **604** maintain information identifying the devices that each services. For example, when the first wireless telephone device **932** initiates a communication to the fourth wireless telephone device **952**, the first DMA gateway **602** accesses data identifying what other DMA gateway, if any, services the fourth wireless telephone device and which DMA server or other network or device associated with the first DMA gateway services the targeted fourth wireless telephone device **952**. DMA gateways provide information to one another regarding the communications networks they service by exchanging register data describing the networks they service. The register data describes devices for which the networks they service are the home network as well as for what devices are visiting on their networks. This information is exchanged directly between the DMA gateways or through a central database described further below with reference to FIG. 10.

A DMA server may associate itself with different DMA gateways. For example, as described with reference to FIGS. 1 and 2, a DMA server may include a mobile device that is easily moved from one place to another. A mobile DMA server that communicates wirelessly with a private IP network and the DMA gateway servicing that private IP network may move out of communications range of a DMA gateway with which it was previously associated into communications range with another DMA gateway. For further example, for purposes of traffic management, fault tolerance, or other reasons, it may be desirable to reassociate a DMA server previously associated with one DMA gateway to another DMA gateway. This reassociation may be initiated manually or automatically by the DMA server, the DMA gateway, or any combination thereof. Thus, for example, the fourth DMA server **642** may be reassociated with the first private IP network **620** and the first DMA gateway **602** servicing the first private IP network **620** as shown by the dashed line **660** in FIG. 6. Because the DMA gateways **602** and **604** bridge the private IP networks **620** and **640**, devices serviced by the fourth DMA server **642**, such as the fourth wireless telephone device **652** may continue to communicate with the wireless telephone devices **654**, **656**, and **658** serviced by the DMA servers **644** and **646** associated with the second private IP network **640**.

The DMA gateways and DMA servers can be arrayed in any number of ways to facilitate the deployment and proliferation of communications networks. For example, FIG. 7 illustrates a network **700** that includes satellite-based DMA gateways including a first satellite-based DMA gateway **702** and a second satellite-based DMA gateway **704**. The satellite-based DMA gateways **702** and **704** are placed in orbits suitable to enable communications with ground-based private IP networks **720** and **740** and a ground-based legacy network **710**. The satellite-based DMA gateways **702** and **704** communicate with each other via a satellite communications network **706**. The second satellite-based DMA gateway **704** communicates with a legacy network, such as a public switched telephone network **710**, over a communications uplink **714** via the same satellite communications network

12

**706** through which the satellite-based DMA gateways **702** and **704** communicate or another uplink communications medium. The satellite-based DMA gateways **702** and **704** communicate with private IP networks **720** and **740** that may include ground-based private IP networks, via the same satellite communications network **706** or other uplink communications media. An advantage of including satellite-based DMA gateways is the ability to bridge DMA servers or groups of DMA servers with one another even though the DMA servers or groups of DMA servers may be disposed remotely from each other where ground-based DMA gateways or ground-based communications media between the DMA servers are overtaxed, unreliable, unavailable, or otherwise undesirable.

Using the satellite-based DMA gateways **702** and **704**, communications between the DMA servers, the devices they serve, and the legacy network operates in a similar manner to the communications between devices as described with reference to FIG. 6. A first group of DMA servers **722**, **724**, and **726** communicate via a first private IP network **720**. A first wireless telephone device **732** in communication with a first DMA server **722** is able to communicate with a second wireless telephone device **734** in communication with a second DMA server **724** via the first private IP network **720**. Further, the first wireless telephone device **732** is enabled, via the first DMA server **722** and the first private IP network **720**, to communicate with the first DMA gateway **702**. Then, via the satellite communications network **706**, the first DMA gateway **702** is able to communicate with the second DMA gateway **704** to enable communications with devices served by the second private IP network **740**. Thus, the DMA gateways **702** and **704** allow the first wireless telephone device **732** to communicate with a third wireless telephone device **762** even though the wireless telephone devices **732** and **762** participate in separate private IP networks **720** and **740**. In addition, because the second DMA gateway **704** is in communication with both the second private IP network **740** and the public switched telephone network **710**, the second DMA gateway **704** enables mobile-to-land communications between third wireless telephone device **762** and a wired landline device **712**. The use of satellite-based DMA gateways **702** and **704** enables this communication even a vast distances separate the communication devices and there are little or no land-based communications networks between the devices.

FIG. 8 illustrates a communications network **800** in which, instead of utilizing satellite-based DMA gateways, employs a ground-based DMA gateway **830** facilitating communications between satellite-based DMA servers **810** and **820**. In areas where, for example, a ground-based DMA server cannot be employed or the distance between wireless communication devices **812** and **814** is so large that one or more DMA servers may not be able to effectively service the wireless communication devices **812** and **814**, it may be desirable to enable communications with the deployment of satellite-based DMA servers such as DMA servers **810** and **820**. In such a case, the wireless communications devices **812** and **814** may include wireless satellite communications devices or other devices with access to a satellite uplink communications medium. As in the case of DMA servers previously described, a first wireless communications device **812** in communication with a first DMA server **810** may wirelessly communicate with a second wireless communications device **814** is also in communication with the first DMA server **810**.

In addition, because the first DMA server **810** is in communication with a ground-based DMA gateway **830** via a suitable uplink communications medium **840**, the first DMA server **810** is able to route communications between the

US 7,855,988 B2

13

devices it serves and other devices in communication with the DMA gateway 830. For example, the DMA gateway 830 is in communication with a first ground-based DMA server 850 that services a first wireless telephone device 852. As a result, the wireless communications devices 812 and 814 are able to communicate with the first wireless telephone device 852. Similarly, the DMA gateway 830 also is in communication with a private IP network 880 that provides communications between the second satellite-based DMA server 820 and two ground-based DMA servers 860 and 870. As a result, the DMA gateway 830 enables communications between the wireless communications devices 812 and 814 serviced by the first satellite-based DMA server 810, the first wireless telephone device 852 serviced by the ground-based DMA server 850, a second wireless telephone device 862 serviced by a second ground-based DMA server 860, a third wireless telephone device 872 serviced by a third ground-based DMA server 870, and any devices (not shown in FIG. 8) serviced by the second satellite-based DMA server 820. In addition, if the DMA gateway 830 were in communication with one or more legacy networks, the DMA gateway 830 could enable communications between devices serviced by the legacy networks and devices serviced by the DMA servers 810, 820, 860, and 870 in communication with the DMA gateway 830.

FIG. 9 illustrates a communications network 900 illustrating how a communications network may include a combination of satellite-based and ground-based DMA servers and satellite-based and ground-based DMA gateways. Embodiments of the present disclosure are not restrictive to including only ground-based or satellite-based DMA gateways were DMA servers and thus provide flexibility in creating and proliferating communications networks based on the communications needs for which the network is deployed.

A first satellite-based DMA server 910 communicates with wireless communications devices 912 and 914. The first satellite-based DMA server 910 also is in communications with a satellite communications network 940 and a private IP network 950. Via the satellite communications network 940, first the satellite-based DMA server is able to communicate with a satellite-based DMA gateway 930 to, for example, enable communications between devices served by a first ground-based DMA server, such as a first wireless telephone 992. Via the private IP network 950, the satellite-based DMA server 910 also is able to communicate with other DMA gateways, such as a first ground-based DMA gateway 960 and a second ground-based DMA gateway 970. Thus, the devices served by the satellite-based DMA server 910 would be able to communicate with devices in communication with the ground-based DMA gateways 960 and 970, such as the second wireless telephone device 974 that is serviced by a second ground-based DMA server 972 in communication with the second ground-based DMA gateway 970. In sum, as described in the particular illustrative embodiments depicted in FIGS. 6-9, satellite-based or ground-based DMA servers and satellite-based or ground-based gateways can be deployed as desired to enable communications between various communications devices.

To facilitate communications between devices serviced by different networks, the DMA gateways maintain information identifying the devices that each services. For example, a user of a wireless telephone device serviced by a first DMA server may send a communication to the user of the target wireless telephone device that is serviced by a second DMA server. The first and second DMA servers both are in communication with a DMA gateway that enables communications between the devices serviced by the different DMA servers. The DMA gateway is configured to route the communications by access-

14

ing information indicating which DMA servers provide service to which wireless devices. The DMA gateway may maintain the information locally in the DMA gateway or access information maintained in a central register accessible to the DMA gateway. When the information is maintained locally in the DMA gateway, DMA gateways in the network provide information to one another regarding the devices they service by exchanging register data describing the devices they service. The register data describes devices for which the networks they service are the home network as well as for what devices are visiting on their networks. This information is exchanged directly between the DMA gateways or through a central database described further below with reference to FIG. 10.

FIG. 10 shows a network 1000 including a pair of DMA gateways 1010 and 1050 that facilitate communications between devices on different types of networks. A first DMA gateway 1010 communicates with a plurality of DMA servers 1012, 1014, and 1016 and a plurality of legacy networks 1020, 1030, and 1040. As described below with reference to FIG. 11, the DMA gateway 1010 includes interfaces configured to communicate with a PSTN 1020, a mobile switching center (MSC) 1030 such as used by wireless telephones and communications devices, and a public IP network 1040. The DMA gateway 1010 thus permits communication between devices serviced by the DMA servers 1012, 1014, and 1016 and devices serviced by the associated legacy networks 1020, 1030, and 1040.

In addition, the DMA gateway 1010, through the satellite communications network 1080 or other DMA gateway network, communicates with other DMA gateways to support communications between the devices serviced by different DMA gateways. For example, the second DMA gateway 1050 is associated with a private IP network 1060 that services a plurality of DMA servers 1052, 1054, 1056 and the devices they serve. Thus, through the DMA gateways 1010 and 1050, devices serviced by one of the DMA servers 1012, 1014, and 1016 or devices serviced by the legacy networks 1020, 1030, and 1040, can communicate with devices serviced by the DMA servers 1052, 1054, and 1056 or other networks serviced by the second DMA gateway 1050. The private IP network 1060 also includes a central register database 1070 that maintains information serviced by DMA gateways and DMA servers within the network 1000. The operation of this central register database 1070 is described further below.

As shown in FIG. 10, one or more of the DMA servers 1012, 1014, and 1016 may communicate directly with a respective DMA gateway, such as DMA gateway 1010, through a satellite uplink or other communications medium. Alternatively, one or other DMA servers 1052, 1054, and 1056 may communicate with a DMA gateway, such as DMA gateway 1050, via a private IP network 1060 in which the DMA servers 1052, 1054, and 1056 and the DMA gateway 1060 participate. When a DMA server communicates with a DMA gateway over a private IP network, the respective DMA server and DMA gateway may communicate with each other by transmitting IP packet data over the private IP network. On the other hand, when the DMA server communicates with the DMA gateway via a different medium, the DMA server and DMA gateway may communicate with each other according to the protocol of the available medium.

In the networks of FIGS. 6-10, embodiments of DMA gateways exchange communications information identifying devices serviced by one or more DMA servers or other communications networks that the DMA gateways service. When a DMA gateway detects that it is in communications range

US 7,855,988 B2

15

with one or more DMA servers, the DMA gateway sends communications information from the DMA servers or other communications networks to one or more other DMA gateways or to a central database, such as the central register database 1070. The communications information may include a notification of what DMA server or servers with which the DMA gateway is in communication. As DMA gateways move between communications ranges of various DMA servers or vice versa, the DMA gateways may send additional notifications or other information to update the previously-communicated communications information as to what communications networks are accessible to the various DMA gateways.

The communications information, in one embodiment, includes register information, such as home location register (HLR) information and visitor location register (VLR) information maintained by the DMA servers or other communications networks. As described with reference to FIG. 1 and FIG. 2, because a DMA server may include a portable or mobile device, the DMA server information also may identify whether the DMA gateway is a home gateway for the DMA server or whether the DMA server is temporarily registered with the DMA gateway in a visitor DMA register.

When another DMA gateway receives the DMA server information from a first DMA gateway, a second DMA gateway stores the DMA server information in a home DMA register in which the second DMA gateway also stores information regarding the devices it services. The second DMA gateway receives a communication from one of the devices it services targeted for a wireless device that is serviced by the first DMA gateway. The second DMA gateway then routes the communication via a DMA gateway network to the first DMA gateway. The first DMA gateway, using its own home DMA register storing information about the devices it services, then directs the communication to the network and/or DMA server that services the targeted communications device.

When the DMA gateway receives DMA server information about one or more DMA services associated with the DMA gateway or information about other networks the DMA gateway services, the DMA gateway may provide the DMA server information to other DMA gateways in a number of ways. For example, the DMA gateway may send a notification to other DMA gateways that it has received the DMA server information and that the DMA server information can be retrieved from the DMA gateway or, as described below, from a central database. The DMA server information is then transmitted to other DMA gateways in response to queries from one or more gateways requesting the DMA server information. Alternatively, the DMA gateway may automatically send the DMA server information to other gateways upon receiving the DMA server information.

Instead of or in addition to sending the DMA server information to other DMA gateways, the DMA gateway may send the DMA server information to a central database as shown in FIG. 10. Then, for example, when a DMAG gateway such as DMA gateway 1010 is in communications range of a DMA server such as DMA server 1012, the DMA server information is sent to the central register database 1070. The DMA server information is sent from the DMA gateway 1010 via the satellite communications network 1080 to the DMA gateway 1050 where the DMA server information is routed via the private IP network 1060 to the central register database. Thus, as DMA server networks and other networks are added to the system, the DMA gateway servicing each of these communications networks receives the communications information for the communications network and sends the communica-

16

tions information to the central register database 1070. Then, other DMA gateways each can receive the new communications information from the central register database 1070.

The new communications information may be automatically sent by the central register database 1070 via the DMA gateway 1050 that services the central register database. Alternatively, when new communications information is received, the DMA gateway receiving the communications information or the central register database 1070 may send a notification to other DMA gateways that the new information is available for retrieval.

FIG. 11 shows an operating environment 1100 including a plurality of networks serviced by a DMA gateway 1102. The DMA gateway 1102 services networks through a plurality of interfaces configured to support different types of networks. The DMA gateway 1102 communicates with a private IP network 1104, such as that used to communicate with one or more DMA servers and/or a central register database as shown in FIG. 7, via a data network interface 1106. The DMA gateway 1102 communicates with the DMA gateway network, which in this example includes a satellite network 1108, via a satellite network interface 1110. In addition, the DMA gateway 1102 includes one or more interfaces that enable the DMA gateway 1102 to communicate with one or more legacy networks. For example, the DMA gateway 1102 communicates with a public switched telephone network (PSTN) or integrated services digital network (ISDN) 1112 via a PSTN/ISDN interface 1114. The DMA gateway 1102 communicates with a public IP network 1116 via a public IP interface 1118 that enables the DMA gateway 1102 to, for example, exchange Internet data or voice over Internet protocol (VoIP) calls. The DMA gateway 1102 also communicates with a wireless network 1120 via a mobile device interface 1122. The DMA gateway 1102 also communicates with an ANSI-41 network 1124 via an SS7 TCAP/SCCP interface 1126 operable to be used in ISUP signaling, DMA server identification, roamer registration, and other functions described with reference to the SS7GW interface 522 described with reference to FIG. 5.

One or more processors 1130 is coupled with the interfaces 1106, 1110, 1114, 1118, and 1122 and a memory device 1140. The memory device 1140 may include one or more of a random access memory, including volatile and nonvolatile rewritable memory devices, a read-only memory, and data storage devices. The memory device 1140 maintains a plurality of software modules providing executable instructions to the processor 1130 to support for the functions of the DMA gateway 1102. The modules include one or more gateway modules 1142 that include the operating system and basic control software that enables the processor 1130 to interact with its network interfaces. One or more conversion modules 1144 control the translation of data and data formats used by one of the networks to that of one or more other networks to which data is to be communicated. One or more routing modules 1146 provide instructions to the processor for routing communications between the appropriate interfaces. The routing instructions use information about the accessibility of devices through various servers, gateways, and networks. Thus, as information about a communication is received, routing instructions are provided indicating through which DMA gateways the communication is to be directed from its source to its destination.

One or more legacy network communications modules provide instructions for the processor 1130 to interact with each of the legacy communications network interfaces 1114, 1118, 1122. One or more DMA detection modules 1152 provide instructions to the processor for detecting the pres-

US 7,855,988 B2

17

ence of accessible DMA servers and integrating the servers into the DMA network. One or more register data management modules **1154** receive, maintain, and/or forward register data for various networks and devices. The one or more register data management modules **1154** are operably coupled with a community location register (CLR)/visitor location register gateway (VLR)/gateway (GW)/global title (GT) (collectively, CVGG) data storage **1160** to maintain register data for DMA servers and other networks that communicate through the DMA gateway **1102**. The register data stored by embodiments according to the present disclosure are described below with reference to FIGS. **9** and **10**.

The DMA gateway **1102** may be implemented in a number of forms. For example, the DMA gateway **1102** may be implemented as an orbiting satellite, as described with reference to FIGS. **6** and **7**. Alternatively, the DMA gateway **1102** may include either a fixed or portable ground station. The DMA gateways **1102** communicate with each other through a gateway network. In the example of FIGS. **6** and **7**, the gateway network includes a satellite communications network. However, if the DMA gateways include only ground-based stations, the gateway network may include a point-to-point network facilitated by microwave communications, optical or other cabled connections, or other types of communications systems. If the gateway network includes both orbiting and ground-based stations, the gateway network may include a combination of satellite-based and non-satellite based communications systems.

FIGS. **12** and **13** show tables depicting how communications information including register data is stored in the DMA gateways or a central register database. The tables in FIGS. **12** and **13** are a logical representation. The entries within the tables do not represent a single value as might be found, for example, in a single entry of a spreadsheet document. Instead, the entries within the rows and columns of the table represent a category of information stored within the table.

In the example of FIGS. **12** and **13**, representative data is shown for three DMA gateways and three DMA servers, although data for any number of DMA gateways and DMA servers participating in a DMA network may be included in register data tables. In this example, it is assumed that each DMA gateway is in communication with a respective DMA server designated with the same number, e.g., DMA gateway **1** is in communication with DMA server **1**, etc. FIG. **12** shows tables **1200** and **1250** representing the register data stored in each of DMA gateway **1** and DMA gateway **2**, respectively, while FIG. **10** shows a table **1000** representing the register data stored in a central register database for the three DMA gateways.

In the table **1200** for the DMA gateway **1**, three rows **1210**, **1212**, and **1214** store register data for each of the respective DMA servers, DMA server **1**, DMA server **2**, and DMA server **3**. In a CLR database column **1220**, CLR data is stored for each of the three DMA servers and, in a VLR database column **1222**, VLR data is stored for each of the three DMA servers. In DMAG **2** Community HLR database column **1224** and DMAG **3** Community HLR database column **1226**, the HLR data for each of the DMA servers is stored for DMA gateway **2** and DMA gateway **3**, respectively. In a Visitor DMA Server Register column **1228**, data is stored for one or more DMA servers that are temporarily registered with DMA gateway **1**.

In the table **1250** for the DMA gateway **2**, three rows **1260**, **1262**, and **1264** store register data for each of the respective DMA servers, DMA server **1**, DMA server **2**, and DMA server **3**. In a CLR database column **1270**, CLR data is stored for each of the three DMA servers and, in a VLR database

18

column **1272**, VLR data is stored for each of the three DMA servers. In DMAG **1** Community HLR database column **1274** and DMAG **3** Community HLR database column **1276**, the HLR data for each of the DMA servers is stored for DMA gateway **1** and DMA gateway **3**, respectively. In a Visitor DMA Server Register column **1278**, data for one or more DMA servers that are temporarily registered with DMA gateway **2**.

Referring to FIG. **13**, in the table **1300** for the central register database, three rows **1310**, **1312**, and **1314** store register data for each of the respective DMA servers, DMA server **1**, DMA server **2**, and DMA server **3**. In a DMA gateway **1** HLR database column **1320**, HLR data is stored for each of the three DMA servers. In a DMA gateway **1** VLR database column **1322**, VLR data is stored for each of the three DMA servers. In DMAG **1** Visitor DMA server register column **1324**, data is stored for one or more DMA servers that are temporarily registered with DMA gateway **1**. In a DMA gateway **2** HLR database column **1326**, HLR data is stored for each of the three DMA servers. In a DMA gateway **2** VLR database column **1328**, VLR data is stored for each of the three DMA servers. In DMAG **2** Visitor DMA server register column **1330**, data is stored for one or more DMA servers that are temporarily registered with DMA gateway **2**.

FIG. **14** shows a flow diagram **1400** of an exemplary process for routing communications using DMA gateways. In the example of FIG. **14**, a first DMA server comes in communications range or otherwise becomes accessible to a first DMA gateway while a legacy communications network becomes accessible to a second DMA gateway.

At **1402**, information is received at a first DMA gateway indicating the location of register data for a DMA server. This register data may be stored in another DMA gateway or a central register database. At **1404**, information is received indicating that a second DMA gateway is in communication with a legacy communications network. At **1406**, it is detected that the first DMA server is now in communications range of the first DMA gateway. At **1408**, the first DMA gateway receives the DMAS register data for the first DMA server from the location identified at **1402**. As previously described, this information may be automatically transmitted to the first DMA gateway when it comes within communications range of the first DMA server or the first DMA gateway may request the information from the location where it is stored.

At **1410**, information is received that relates to a data and/or voice communication placed by a mobile device associated with the first DMA server. The information indicates that the communication is directed or placed to a target device accessible via the legacy communications network. The accessibility of the legacy communications network to the second DMA gateway was previously identified to the first DMA gateway at **1404**. Thus, at **1412**, the communication information is routed from the first DMA gateway to the second DMA gateway. The process ends at **1414**. The process repeats indefinitely as desired to relay communications using the DMA gateways.

FIG. **15** shows a flow diagram **1500** of an exemplary process for routing communications to a DMA gateway depending on whether the DMA gateway communicates with a server through a private IP network or through another medium. At **1502**, routing instructions are received at a DMA server from a DMA gateway when the DMA server is in communication with the DMAG, such as when the DMA gateway comes within communications range of the DMA server. At **1504**, a communication is received at the DMA server from a mobile communications device via a wireless

US 7,855,988 B2

19

transceiver coupled to the DMA server. At 1506, it is determined whether the DMA server communicates with the DMA gateway via a private IP network. If so, at 1510, packet data related to the communication is sent as packet data over the private IP network that is received by the DMA gateway via its private IP network interface. On the other hand, if it is determined at 1506 that the DMA server does not communicate with the DMA gateway via a private IP network, at 1512, the information related to the communication is transmitted to the DMA gateway via another medium, such as a direct satellite uplink. The information related to the communication is thus received by the DMA gateway via a satellite communications network interface.

At 1514, the communication is routed from the DMA gateway to the destination device. The communication is routed using information received and maintained by the DMA gateway as described, for example, in FIG. 14. The process ends at 1516. The process repeats indefinitely as desired to relay communications using the DMA gateways.

The above-disclosed subject matter is to be considered illustrative, and not restrictive, and the appended claims are intended to cover all such modifications, enhancements, and other embodiments, which fall within the true spirit and scope of the present invention. Thus, to the maximum extent allowed by law, the scope of the present invention is to be determined by the broadest permissible interpretation of the following claims and their equivalents, and shall not be restricted or limited by the foregoing detailed description.

What is claimed is:

1. A method, comprising:

receiving at a first distributed mobile architecture (DMA) gateway communications information for a communications network accessible by a second DMA gateway, the communications information indicating one or more devices accessible by one of a DMA server and a legacy communications network, wherein the first DMA gateway and the second DMA gateway participate in a DMA gateway communications network;

storing the communications information in a home DMA register of the first DMA gateway;

receiving a communication at the first DMA gateway for a target device indicated by the communications information to be served by the second DMA gateway; and

routing the communication from the first DMA gateway to the target device by relaying the communication from the first DMA gateway to the second DMA gateway via the DMA gateway communications network.

2. The method of claim 1, wherein:

at least one of the first DMA gateway and the second DMA gateway includes a satellite-based DMA gateway; and the DMA gateway communications network includes a satellite communications network.

3. The method of claim 1, wherein the DMA server includes one of:

a ground-based DMA server; and

a satellite-based DMA server.

4. The method of claim 1, wherein the communication includes at least one of:

a voice communication; and

a data communication.

5. The method of claim 1, wherein the legacy communications network includes one of:

a public switched telephone network (PSTN);

a wireless communications network serviced by mobile switching center (MSC);

a public internet protocol (IP) network; and

20

an American National Standards Institute 41 (ANSI-41) network.

6. The method of claim 1, further comprising the first DMA gateway sending a notification to the second DMA gateway, the notification indicating that the communications information is stored at the first DMA gateway.

7. The method of claim 1, further comprising, upon receiving the communications information, the first DMA gateway automatically sending at least a portion of the communications information to the second DMA gateway via the gateway communications network.

8. The method of claim 1, further comprising, in response to receiving a query from the second DMA gateway for the communications information, the first DMA gateway sending at least a portion of the communications information to the second DMA gateway via the gateway communications network.

9. The method of claim 1, wherein the communications information includes communications register data including at least one of:

a portion of a community location register;

a portion of home location register (HLR) data for the communications network; and

a portion of visitor location register (VLR) data for the communications network.

10. The method of claim 9, wherein the register data stored at the first DMA gateway indicates that the register data is for a DMA server temporarily registered in a visitor DMA register of the second DMA gateway.

11. The method of claim 1, further comprising the first DMA gateway detecting the presence of the communications network within a communications range of the first DMA gateway.

12. The method of claim 11, further comprising the first DMA gateway sending communications network information to the second DMA gateway indicating that the communications network is within the communications range of the first DMA gateway.

13. The method of claim 11, further comprising the first DMA gateway sending communications network information to a central database indicating that the communications network is within the communications range of the first DMA gateway.

14. The method of claim 11, further comprising the first DMA gateway receiving additional communications network information from the second DMA gateway indicating that the second DMA gateway detects the presence of an additional communications network within a communications range of the second DMA gateway.

15. The method of claim 1, further comprising the first DMA gateway receiving a second notification from a central database, the second notification indicating that second register data is stored at the central database.

16. The method of claim 15, further comprising the first DMA gateway detecting a second communications network in a service area of the first DMA gateway.

17. The method of claim 16, wherein the first DMA gateway detects a private Internet Protocol (IP) network access point within a communications range of the first DMA gateway and wherein the first DMA gateway is adapted to communicate with the second communications network via the private Internet protocol (IP) network.

18. The method of claim 16, wherein the first DMA gateway sends second communications information to the central database indicating that calls associated with the second communications network are accessible to the first DMA gateway.

US 7,855,988 B2

**21**

19. The method of claim 18, wherein the first DMA gateway receives the second register data from the central database.

20. The method of claim 1, wherein the first DMA gateway receives the communications information from the second DMA gateway.

21. The method of claim 1, wherein the first DMA gateway receives the communications information from a central database.

22. A network communications system, comprising:

a first distributed mobile architecture (DMA) gateway including:

a first interface adapted to communicate with a legacy communications network;

a second interface adapted to communicate with a private Internet Protocol (IP) network;

a third interface adapted to communicate with a DMA gateway communications network; and

a server having logic adapted to:

receive legacy network information from a second DMA gateway, the legacy network information indicating that the legacy communications network is in a communications range of the second DMA gateway; and

forward information associated with a call received from a DMA server via the second interface to the second DMA gateway via the third interface;

wherein the call is placed to a destination device accessible via the legacy communications network.

23. The system of claim 22, wherein at least one of the first DMA gateway and the second DMA gateway comprises a satellite-based DMA gateway.

24. The system of claim 22, wherein at least one of the first DMA gateway and the second DMA gateway comprises a ground-based DMA gateway.

25. The system of claim 22, wherein the DMA server includes one of:

a ground-based DMA server; and

a satellite-based DMA server.

26. The system of claim 22, wherein the logic is adapted to receive DMA server register data from the DMA server indicating that a mobile communications device is accessible to the DMA server via a wireless transceiver coupled to the DMA server.

27. The system of claim 22, wherein the first DMA gateway communicates with a central database via the third interface, the central database storing register data associated with the DMA server.

28. The system of claim 22, wherein the first DMA gateway communicates with a central database via the second interface, the central database storing register data associated with the DMA server.

29. The system of claim 22, wherein the first DMA gateway and the second DMA gateway communicate via C-Band, Ku-Band, Ka-Band, L-Band, or any combination thereof.

30. The system of claim 22, wherein the gateway communications network comprises at least one of an IP network and a microwave network.

31. The system of claim 22, wherein the legacy communications network includes one or more of:

a public switched telephone network (PSTN);

a wireless network;

a public IP network; and

an American National Standards Institute 41 (ANSI-41) network.

**22**

32. The system of claim 22, wherein the DMA server is one of a plurality of DMA servers communicating with the first DMA gateway via the second interface.

33. A method of routing calls via a communications network, the method comprising:

receiving first routing instructions at a first distributed mobile architecture (DMA) server from a first DMA gateway when the first DMA server is in a first service area of the first DMA gateway, the first DMA gateway comprising a first orbiting satellite; and

sending a first call received at the first DMA server from a first mobile communications device via a wireless transceiver integrated with the first DMA server to the first DMA gateway via a private Internet Protocol (IP) network according to the first routing instructions;

wherein the first call is placed to a destination device accessible via a legacy communications network, the legacy communications network accessible via the first DMA gateway.

34. The method of claim 33, wherein the first DMA server is adapted to send the first call while being transported from a first location to a second location.

35. The method of claim 34, wherein the first DMA server receives second routing instructions from a second DMA gateway when the first DMA server moves into a second service area of the second DMA gateway, the second service area comprising the second location and the second DMA gateway comprising an orbiting satellite.

36. The method of claim 35, wherein the first DMA server sends a second call received at the first DMA server from the first mobile communications device to the second DMA gateway via the private IP network according to the second routing instructions.

37. The method of claim 36, wherein the second call is associated with a destination device accessible via the legacy communications network.

38. The method of claim 36, wherein the second call is associated with a second mobile communications device accessible to a second DMA server, the second DMA server accessible to the second DMA gateway via the private IP network.

39. The method of claim 35, wherein the first DMA server receives the second routing instructions from the second DMA gateway during the first call.

40. The method of claim 35, wherein the first DMA server sends first DMA server register data to the second DMA gateway in response to receiving the second routing instructions.

41. The method of claim 33, wherein the first DMA server receives second routing instructions from a second DMA gateway when the first DMA server leaves the first service area and enters a second service area of the second DMA gateway due to orbital motion of the first DMA gateway and the second DMA gateway, the second DMA gateway comprising an orbiting satellite.

42. A network communications system, comprising:

a distributed mobile architecture (DMA) server coupled to a wireless transceiver, the DMA server including:

a first interface adapted to communicate with a private Internet Protocol (IP) network;

a second interface adapted to communicate with a gateway communications network; and

a server having logic adapted to:

receive a call from a mobile communications device via the wireless transceiver; and

send call information related to the call to a DMA gateway;

US 7,855,988 B2

**23**

wherein the call is placed to a destination device accessible via a legacy communications network, the legacy communications network accessible via the DMA gateway.

**43.** The system of claim **42**, wherein the logic is adapted to send the call information to the DMA gateway via the first interface according to routing instructions received at the DMA server from the DMA gateway.

**24**

**44.** The system of claim **42**, wherein the logic is adapted to send the call information to the DMA gateway via the second interface according to routing instructions received at the DMA server from the DMA gateway.

**45.** The system of claim **42**, wherein the logic is adapted to convert the call information to packet data when the call information is sent to the DMA gateway via the first interface.

\* \* \* \* \*

**CERTIFICATE OF COMPLIANCE WITH RULE 32(b)**

1. This brief complies with the type-volume limitation of Fed. Cir. R. 32(b)(1) because this brief contains 10,589 words, exclusive of the items exempted by Fed. R. App. P. 32(f) and Fed. Cir. R. 32(b)(2).

2. This brief complies with the typeface requirements of Fed. R. App. P. 32(a)(5) and the type style requirements of Fed. R. App. P. 32(a)(6) because this brief has been prepared in a proportionally spaced typeface using Microsoft Word in Garamond 14 point font.

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/s/ Aaron M. Frankel

Aaron M. Frankel