IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF TEXAS
DALLAS DIVISION

LEMKO CORPORATION, an Illinois Corporation, Plaintiff, vs. MICROSOFT CORPORATION, a Washington Corporation, and AFFIRMED NETWORKS, INC., a Delaware Corporation, Defendants.	)	Civil Action No. 3:22-CV-363-L-BT **DEMAND FOR JURY TRIAL**

SECOND AMENDED COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Lemko Corporation ("Lemko") files this Second Amended Complaint for Patent Infringement and Demand for Jury Trial against Microsoft Corporation ("Microsoft") and Affirmed Networks, Inc. ("Affirmed Networks") (collectively, "Defendants") and alleges as follows:

THE PARTIES

1. Lemko is an Illinois corporation, with its principal place of business at 935 National Pkwy, Suite 93510, Schaumburg, IL 60173. Founded in 2004, Lemko is a world leader in the development of advanced network technology solutions in multi-access edge computing ("MEC") for providing fully edge-capable mobile network platforms and resilient wireless networks.

2. Microsoft is a Washington corporation. Microsoft may be served through its agent for service of process, CSC Lawyers Incorporating Service Company, at 211 E. 7th Street, Suite 620, Austin, TX 78701-3218.

3. Affirmed Networks is a Delaware corporation. Affirmed Networks may be served through its agent for service of process, CSC Lawyers Incorporating Service Company, at 211 E. 7th Street, Suite 620, Austin, TX 78701-3218.

4. Microsoft acquired Affirmed Networks in 2020, and Affirmed Networks is now a wholly-owned subsidiary of Microsoft. Microsoft and Affirmed Networks variously developed the Accused Products (defined below).

5. Affirmed Networks directly competes with Lemko for market share in the global virtualized Evolved Packet Core market. *See, e.g.*, Exhibit 1A, https://www.businesswire.com/news/home/20220928005508/en/Insights-on-the-Virtualized-Evolved-Packet-Core-Global-Market-to-2027---Featuring-Affirmed-Networks-Cisco-Systems-Lemko-and-Nokia-Among-Others---ResearchAndMarkets.com (recognizing Affirmed Networks and Lemko as competitors).

JURISDICTION AND VENUE

6. This action for patent infringement arises under the patent laws of the United States, 35 U.S.C. § 101 *et seq.* The Court has original jurisdiction over this controversy pursuant to 28 U.S.C. §§ 1331 and 1338.

7. Venue is proper in this Court pursuant to 28 U.S.C. §§ 1391(b) and (c) and 1400(b).

8. The Court has personal jurisdiction over Microsoft because Microsoft has continuous and systematic contacts with this District. Microsoft maintains an office in this District at 7000 and 7100 State Highway 161, Building LC1 & LC2, Irving, Texas 75039. On information and belief, this office is a regular and established place of business.

9. The Court has personal jurisdiction over Affirmed Networks because Affirmed Networks has continuous and systematic contacts with this District. Affirmed Networks

maintains an office in this District at 2280 Campbell Creek Boulevard, Suite # 325, Richardson, TX 75082. On information and belief, this office is a regular and established place of business. For example, at the time of the filing of the original complaint, Affirmed Networks was actively hiring employees for multiple positions based in Dallas. Exhibit 1B (Microsoft webpage listing job postings).

10. Additionally, the Court has personal jurisdiction over Defendants in this action because Defendants have committed acts of direct and indirect infringement in this District, including through selling and offering for sale infringing products and services in this District, because Lemko's claims arise out of and relate to Defendants' acts of infringement in this District, and because the Court's exercise of jurisdiction over Defendants in this action would be reasonable and would not offend traditional notions of fair play and substantial justice given Defendants' persistent presence and contact with this District.

11. Defendants did not challenge venue or the Court's personal jurisdiction in responding to Lemko's original and first amended complaints.

LEMKO'S INNOVATIONS AND ASSERTED PATENTS

12. Lemko's products are based on innovative paradigms that improved over then-conventional technology due to their decentralized and virtualized nature. Before Lemko's inventions, conventional cellular networks were based on circuit-switched, circuit transmission networks with a centralized, hierarchical architecture. All calls were carried from cell towers to regional call centers over expensive circuit backhaul connections. The regional call centers relied on stacks of custom hardware to manage and route calls for an entire region. The cell towers had no functionality for managing and routing calls, since that capacity was located in the centralized regional call centers. This approach had many disadvantages, including the need for expensive backhaul to and from regional call centers, even when the two parties to a

phone call were in the same area, because the cell towers could not manage or connect calls independent of the regional call centers.

13. Conventional networks were also hardware-based. The centralized mobile switching centers ("MSCs") were housed at large Digital Signal Processor ("DSP") equipment server centers, where the MSCs relied on stacks of DSP equipment servers to provide voice and data call processing functionality for the networks, including switching functions, call set-up, call termination, account management, and routing.

14. Lemko's products and services use a novel, distributed mobile architecture ("DMA") structure. Lemko's decentralized networks allow for all network function virtualization ("NFV"), which is also referred to as virtualized network function ("VFN") and Network Functions Virtualization Infrastructure ("NFVI"), for MEC systems. MEC refers to locating computing of traffic and services closer to the customer (the "edge" of a network), as opposed to locating that hardware computing functionality in centralized server farms.

15. Lemko's decentralized DMA architecture offers significant benefits over the networks that were conventional at the time of its inventions. In contrast to the centralized conventional networks, Lemko's DMA networks are implemented with software-based DMA servers, which are connected to form peer-to-peer DMA networks. Cellular network management functionality is distributed to each DMA server, which operates at the edge of the network, close to the customers. When the target of the call is within range of a DMA server, the system can connect the call without involving the centralized servers of a regional call center.

16. Lemko's networks are also virtualized, which refers to providing the network management functionality through software instead of dedicated DSP hardware resources.

Lemko's technology implements network functionalities, such as MSC, Base Station Controller ("BSC"), community location register ("CLR"), and home location register ("HLR"), on software running on decentralized, standard servers, especially edge servers.

17. Lemko's innovative approach enables connecting multiple cellular nodes as peers via IP connections, thereby reducing or eliminating the need to connect calls through backhaul to centralized centers or hubs.[1]

18. Lemko's approach dramatically lowers up-front capital expenses and operating costs by reducing the need for backhaul and virtualizing the core network for mobile communications.[2] This enables applications previously deemed cost prohibitive, such as deployments in rural areas where there are not enough customers to justify the high costs of then-conventional networks.

19. To-date, the United States Patent and Trademark Office ("USPTO") awarded over 30 utility patents to Lemko covering solutions for providing MEC networks and other improvements in communications technology and underlying hardware infrastructure.

20. On June 16, 2009, the USPTO issued U.S. Patent No. 7,548,763 (the "'763 Patent"), entitled "System, Method, and Device for Providing Communications Using a Distributed Mobile Architecture." The '763 Patent identifies Dr. Shaowei Pan as its inventor and was assigned to Lemko. Attached hereto as Exhibit 2 is a true and correct copy of the '763 Patent.

[1] Base Transceiver Stations ("BTS") are cellular radios that facilitate wireless connections between mobile devices (conventionally called user equipment or "UE") and networks. BTSs are specifically called NodeBs in 3G networks, E-UTRAN Node Bs ("eNodeB") in 4G networks, and Next Generation Node Bs ("gNb") in 5G networks.

[2] The core network is the central component of a mobile communications network and provides a variety of functions to control and manage the network.

21. The ’763 Patent generally discloses providing for group communications between participants, where each participant communicates with a BTS (base transceiver station) controller coupled to a DMA server. The DMA servers may be configured to permit duplex communications capabilities between participants.

22. On January 26, 2010, the USPTO issued U.S. Patent No. 7,653,414 (the “’414 Patent”), entitled “System, Method, and Device for Providing Communications Using a Distributed Mobile Architecture.” The ’414 Patent identifies Dr. Pan as its inventor and was assigned to Lemko. Attached hereto as Exhibit 3 is a true and correct copy of the ’414 Patent.

23. The ’414 Patent generally discloses a DMA system that includes an authentication, authorization, and accounting (“AAA”) module with a destination preference register, which includes a preferred path for communications to be routed outside of a DMA network accessible to the DMA system.

24. On December 21, 2010, the USPTO issued U.S. Patent No. 7,855,988 (the “’988 Patent”), entitled “System, Method, and Device for Routing Calls Using a Distributed Mobile Architecture.” The ’988 Patent identifies Dr. Pan as its inventor and was assigned to Lemko. Attached hereto as Exhibit 4 is a true and correct copy of the ’988 Patent.

25. The ‘988 Patent generally discloses network communications systems for routing communications between distributed mobile architecture servers using DMA gateways (“DMAGs”) where communications information indicates one or more devices accessible by one of a group of DMA servers and a legacy communications network. Communication information is received at a first DMAG for a communications network accessible by a second DMAG.

26. On January 31, 2012, the USPTO issued U.S. Patent No. 8,107,409 (the "'409 Patent"), entitled "OAMP for Distributed Mobile Architecture." The '409 Patent identifies Dr. Pan as its inventor and was assigned to Lemko. Attached hereto as Exhibit 5 is a true and correct copy of the '409 Patent.

27. The '409 Patent generally discloses a DMAG that routes communications to DMA nodes and roaming DMA nodes, including communications received from a legacy network, and to DMA nodes that can send performance data to a home DMAG and to a visitor DMAG.

28. On April 1, 2014, the USPTO issued U.S. Patent No. 8,688,111 (the "'111 Patent"), entitled "System, Method, and Device for Providing Communications Using a Distributed Mobile Architecture." The '111 Patent identifies Dr. Pan as its inventor and was assigned to Lemko. Attached hereto as Exhibit 6 is a true and correct copy of the '111 Patent.

29. The '111 Patent generally discloses receiving at a first DMA system communications from a first mobile device directed to a second mobile device and determining, based on information stored at an AAA module, whether the second mobile device is registered with one of the first DMA system and a second DMA system.

30. On November 17, 2015, the USPTO issued U.S. Patent No. 9,191,980 (the "'980 Patent"), entitled "System and Method to Control Wireless Communications." The '980 Patent identifies Dr. Pan as its inventor and was assigned to Lemko. Attached hereto as Exhibit 7 is a true and correct copy of the '980 Patent.

31. The '980 Patent generally discloses controlling wireless communications when communications are associated with a destination device and received from a first mobile device at a BTS interface of a first DMA server to determine if a first DMAG supports

communications with the destination device based on registration data stored at the first DMA server.

32. On May 3, 2016, the USPTO issued U.S. Patent No. 9,332,478 (the "'478 Patent"), entitled "System, Method, and Device for Routing Calls Using a Distributed Mobile Architecture." The '478 Patent identifies Dr. Pan as its inventor and was assigned to Lemko. Attached hereto as Exhibit 8 is a true and correct copy of the '478 Patent.

33. The '478 Patent generally discloses transmitting communications information from a first DMAG to a second DMAG in a DMAG communication network, where the information is associated with a communication network accessible by the first DMAG, and receiving a communication from the second DMAG via the DMAG communication network.

34. On September 5, 2017, the USPTO issued U.S. Patent No. 9,755,931 (the "'931 Patent"), entitled "Fault Tolerant Distributed Mobile Architecture." The '931 Patent identifies Dr. Pan as its inventor and was assigned to Lemko. Attached hereto as Exhibit 9 is a true and correct copy of the '931 Patent.

35. The '931 Patent generally discloses detecting a failure condition relating to a first DMAG at a DMAG management system in communication with at least the first DMAG, a second DMAG, and DMA nodes, and determining if a first DMAG is offline based on a failure condition, selecting the second DMAG, sending a first notification from the DMAG management system to the second DMAG, and sending a second notification from the DMAG management system to an external system configured to connect calls to a mobile station via the first DMAG.

36. The '763, '414, '988, '409, '111, '980, '478, and '931 Patents are collectively referred to herein as the "Asserted Patents."

37. The Asserted Patents are not abstract and specifically claim inventive concepts that represent significant improvements over conventional networking technology. Each of the Asserted Patents describes specific software architectures that were not conventional at the time of their invention.

38. The Asserted Patents disclose so much more than just a simple combination of generic components to perform conventional activities, such that they claim patent eligible inventions. The Asserted Patents improve networking systems, especially for use in edge networks, and solve specific problems that arise from switching from a centralized, hierarchical network paradigm, where the BTS nodes have no ability to manage or route calls and depend on centralized MSC hubs to control network traffic, to the new DMA paradigm, where call management functionality is distributed.

39. Examples of the problems solved by the Asserted Patents to enable DMA networks and improve the efficiency, reliability, and affordability of networks include determining if a mobile device is registered with a specific DMA network or is roaming and should be connected to a different home DMA network (addressed by the ’111 Patent), interconnecting DMA networks with legacy communication networks (addressed by the ’409 Patent), allowing mobile devices to seamlessly communicate with both local DMAs and non-local legacy networks (addressed by the ’988 Patent), locally routing data to devices instead of using backhaul to an MSC to route local calls (addressed by the ’478 Patent), interconnecting DMAGs to appropriately route communications to destination devices not located within the same local network (addressed by the ’414 Patent), and detecting and responding to network failure conditions (addressed by the ’931 Patent).

40. The technology disclosed in the Asserted Patents was not conventional in the art at the time of the inventions because then-conventional networking systems did not use DMAs or any equivalent architecture where the call management functionality was distributed to the local nodes. In addition, then-conventional networks did not use the various specific network designs covered by the claims of the Asserted Patents, which are based on the novel DMA paradigm. To the contrary, then-conventional technology was based on a hierarchical paradigm where much of the network resources and processing was centrally located in large, air-conditioned server farms, and controlled with large racks of hardware relying on DSP and custom hardware cards, rather than with smaller, distributed network elements that work together at the "edge" of the network.

41. Certain claims of the Asserted Patents variously recite elements not found in then-conventional networks, such as a DMAG with an interface to communicate with a legacy communication network, a home DMA register with a list of DMA nodes and designated to route communications to mobile devices, a visitor DMA register with a list of DMA nodes that are roaming with respect to the DMAG, a DMAG being able to route calls to mobile devices served by roaming DMA nodes, a master agent that receives performance data from DMA nodes, and an operations module that stores the performance data and sends the performance data to DMAGs. Other claims of the Asserted Patents describe further specific and non-conventional functions and networking requirements on DMA servers and DMAGs.

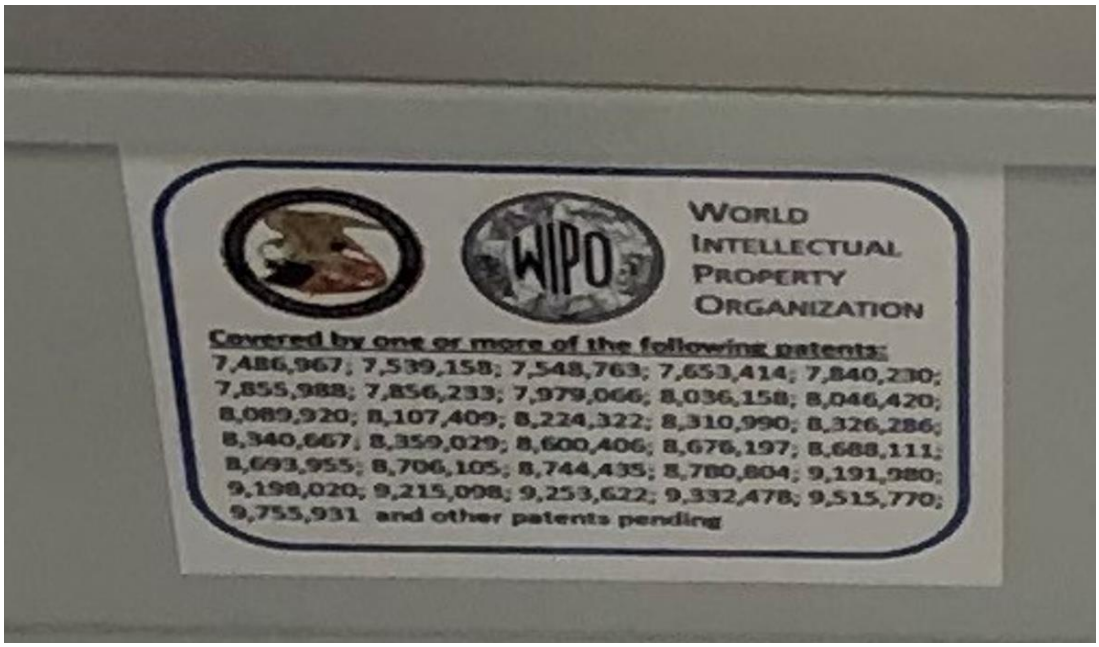
42. In addition, the claims are rooted in computer technology as they are directed to specific software architectures with different applications that improve communication between mobile devices and the hardware infrastructure supporting such communications. Thus, the claims of the Asserted Patents recite specific steps and components to accomplish the

desired results and go beyond simply claiming results. Accordingly, the inventions of the Asserted Patents allow for a new kind of infrastructure and communications network that was not previously possible and that improves communications technology.

LEMKO MARKS ITS PATENT-PRACTICING PRODUCTS

43. At all times Lemko has complied with 35 U.S.C. § 287(a) by marking its patent-practicing products with stickers identifying the applicable Asserted Patents covering those products and further identifying in writing the applicable Asserted Patents in the documentation for its software products. Lemko has not made, offered for sale, or sold any unmarked patent-practicing products.

44. The following is a representative example of Lemko's patent marking labelling, and identifies each of the Asserted Patents (in addition to other Lemko patents).



Detail of patent marking label listing the '763, '414, '988, '409, '111, '980, '478, and '931 Patents.

Full view of Lemko's Node1 product with patent marking label.

DEFENDANTS' INFRINGING PRODUCTS

45. **Overview of the Accused Products:** Defendants make, use, sell, offer for sale, and/or import into the United States and this District products and services that infringe the Asserted Patents (the "Accused Products").

46. The Accused Products are used to provide mobile network control and management functions on a decentralized network, VFN, or NFV, and are used to operate MEC or private telecommunications networks for data transmission and voice calls that can interoperate with outside networks, such as the Internet and common-carrier cellular networks.

47. As discussed in more detail below, the Accused Products include network functionality, servers, and add-on services. Network control software manages the connections between users and the network and provides network access. Servers are used to store and operate the software that provides the mobile network management functionality. Add-on services include a variety of additional functionalities for managing, monitoring, and controlling the networks.

48. Defendants sell the Accused Products to customers as software to operate on the customers' own servers, sell combinations of software and servers to run the software, and sell the Accused Products as a "service" where Defendants configure and operate the Accused Products for their customers. *See, e.g.*, Exhibit 10 at 11 (showing sale of private mobile networks as a service).

49. Over time, Defendants have introduced different versions of the Accused Products to correspond to the then-available network technologies and standards. For example, Affirmed Networks has offered products to provide 4G (Long-Term Evolution, "LTE") network functionality and, more recently, 5G network functionality. These products allowed customers to operate private networks that replicate the functionality of 4G (LTE), 5G, or combination 4G (LTE) and 5G networks while also connecting to the Internet and public-carrier cellular networks.

50. The Accused Products include at least the following products and services:

- Affirmed Mobile Core;
- Affirmed Private Network Service ("APNS");
- Azure Stack Edge ("ASE"); and
- Affirmed Networks' vProbe.

51. **Affirmed Mobile Core:** Prior to Microsoft's acquisition of Affirmed Networks, Affirmed Networks first marketed its mobile packet core (i.e., software for managing and controlling mobile networks) as "vEPC" (virtual Evolved Packet Core) and as "Affirmed Mobile Packet Core." After Microsoft's acquisition of Affirmed Networks, Defendants began to market the same mobile packet core product as "Affirmed Mobile Core," or simply "mobile core" or "mobile packet core." These terms are synonymous. Exhibit 15,

https://www.affirmednetworks.com/products-solutions/virtual-evolved-packet-core/ (showing Affirmed Mobile Core as a vEPC product); Exhibit 13 (Affirmed Mobile Core White Paper) (using Affirmed Mobile Core and vEPC interchangeably and referring to "Affirmed Mobile Core vEPC").

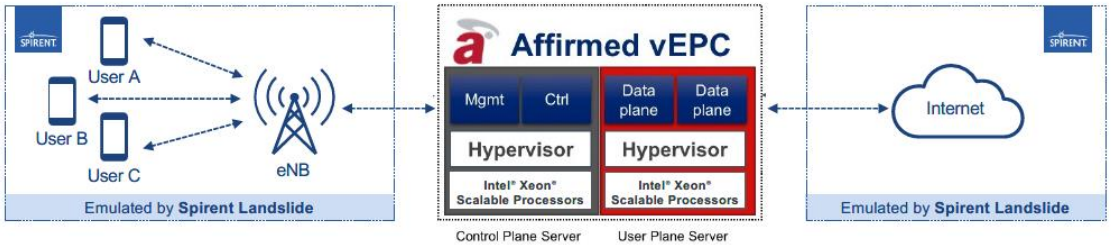


Figure 1. Logical test bed for Affirmed Mobile Core performance tests

Exhibit 13 at 2 (using Affirmed vEPC as the basis for "Affirmed Mobile Core performance tests").

52. Affirmed Mobile Core provides 4G and 5G network functionality and also supports backwards compatibility with earlier networks, such as 2G and 3G compatible devices. Exhibit 11 at 3 ("vEPC platform delivers a full stack of 4G/5G gateway and mobility functions.").

53. Affirmed Networks sometimes uses the term "Evolved Packet Core (EPC)" to refer to just its 4G (LTE) packet core running on an edge server. Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution) (describing vEPC solution).

54. Defendants have stated that Affirmed Mobile Core is "the industry's first fully virtualized mobile core solution" and "enables 5G services today" to bring edge services (IoT services or live streaming) closer to the customers. Excerpted from Defendants' video available at https://www.affirmednetworks.com/products-solutions/virtual-evolved-packet-core/, at 00:49 to 1:35 (referring to vEPC, now Affirmed Mobile Core); *see also* Exhibit 15. Affirmed Mobile Core "delivers the advanced network capabilities that mobile operators need

to deploy a complete 5G non-standalone architecture (NSA) network: control and user-plane separation ('CUPS'), network slicing, service automation, and fully virtualized, cloud-native network functions." Exhibit 11 at 1.

55. For example, in Exhibit 10 at 15, Microsoft describes that "[t]he final component of Microsoft's architectural approach to private mobile networks is the 4G/5G mobile core, which can be deployed as a non-standalone (NSA) 5G core, standalone (SA) 5G core, or 4G vEPC as a single platform . . . . The 5G core can be deployed on VMs [Virtual Machines], physical servers, or on an operator's cloud as a mobile-core-as-a-service, eliminating the need for dedicated hardware." *Id.*

56. Affirmed Networks' 4G Mobile Packet Core product includes virtualized implementations of at least the following 4G network nodes and services: MME (Mobility Management Entity), SGW (Serving Gateway), PGW (Packet Data Network (PDN) Gateway), HSS (Home Subscriber Server), PCRF (Policy and Charging Rules Function), AAA (Authentication, Authorization and Access), SGSN and GGSN (3G packet core components analogous to the SGW and the PGW for 4G), ePDG and TWAG (WiFi gateways for non-trusted and trusted access), CSGN and SCEF (for NB IoT – Internet of Things, factory sensors, etc.). Exhibit 14 at 1. These virtualized functions are provided by software instead of dedicated DSP hardware.

57. Affirmed Networks' 5G Mobile Packet Core product includes virtualized implementations of at least the following 5G network nodes and services: AMF (Access and Mobility Function, analogous to the 4G MME), SMF (Session Management Function), UPF (User Plane Function, (analogous to the 4G SGW and PGW packet handling), NRF (Network Repository Function for managing the network), NSSF (Network Slice Selection Function for

network slicing), NEF (Network Exposure Function for exposing capability information to external entities), and N3IWF (Non-3GPP Interworking Function). These virtualized functions are provided by software instead of dedicated DSP hardware.

58. **Microsoft's Affirmed Private Network Service (APNS).** After acquiring Affirmed Networks, Microsoft began building and selling a bundled, turnkey solution for private networks and enterprises called "Affirmed Private Network Service" or "APNS." APNS uses Affirmed Networks' CUPS technology and deploys the entire Affirmed Mobile Core "at the edge of the network, all in cloud, or in a hybrid mode with control plane on cloud and the user plane on the enterprise edge." Exhibit 16, Affirmed Private Network Service (APNS).pdf at 1-2; *see also* Exhibit 20 at 3 ("The APNS [Affirmed Private Network Service] solution consists of Affirmed Mobile Core, Affirmed Service Manager, Microsoft Azure Stack Edge platform, and Azure Network Function Manager.").

59. APNS is a fully managed private network solution that enables mobile network operators and mobile service providers to quickly deliver private LTE/5G network service to an enterprise. Exhibit 16, Affirmed Private Network Service (APNS).pdf at 1. APNS provides mobility across multiple sites of an enterprise. *Id.*, at 2. Through interworking with mobile operator networks, mobile service providers can offer a full solution for mobility with private networks by keeping enterprise data local "while allowing devices, employees, and visitors/partners full mobility between private and public networks." *Id.* at 2-3.

60. The figure below shows that, in an APNS bundle, Affirmed Mobile Core can be deployed on the ASE server as local (private) MEC, Cloud MEC, or both.

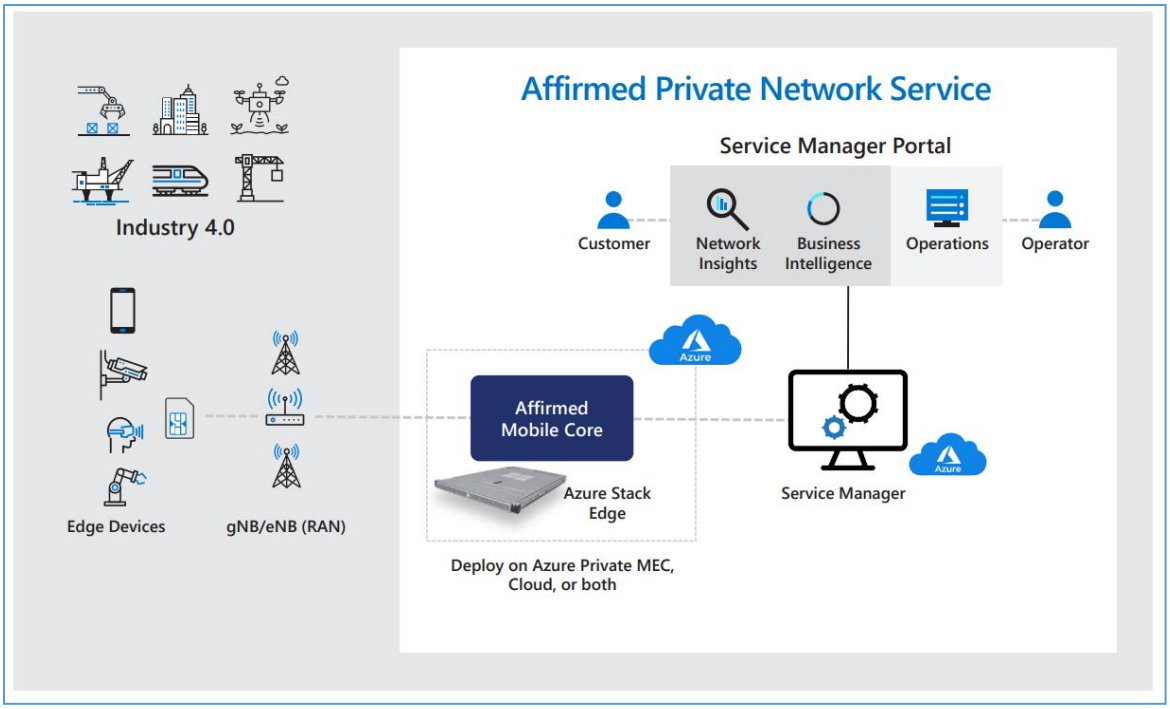


Exhibit 20 at 3; *see also* Exhibit 16, Affirmed Private Network Service (APNS).pdf at 1 (in an APNS deployment, Affirmed Mobile Core is at the edge of the network, all in the cloud, or in a hybrid mode with control plane on cloud and user plane on the enterprise edge).

61. Microsoft advertised to its customers and the public that it combined Affirmed Networks' software with Microsoft's Azure cloud and ASE servers in a fully integrated private mobile network service designed for mobile operators and managed service providers. Exhibit 10 at 3. As shown below, APNS combines Azure cloud, Azure Stack Edge, Affirmed Mobile Core, and end-to-end orchestration and management. *Id*.

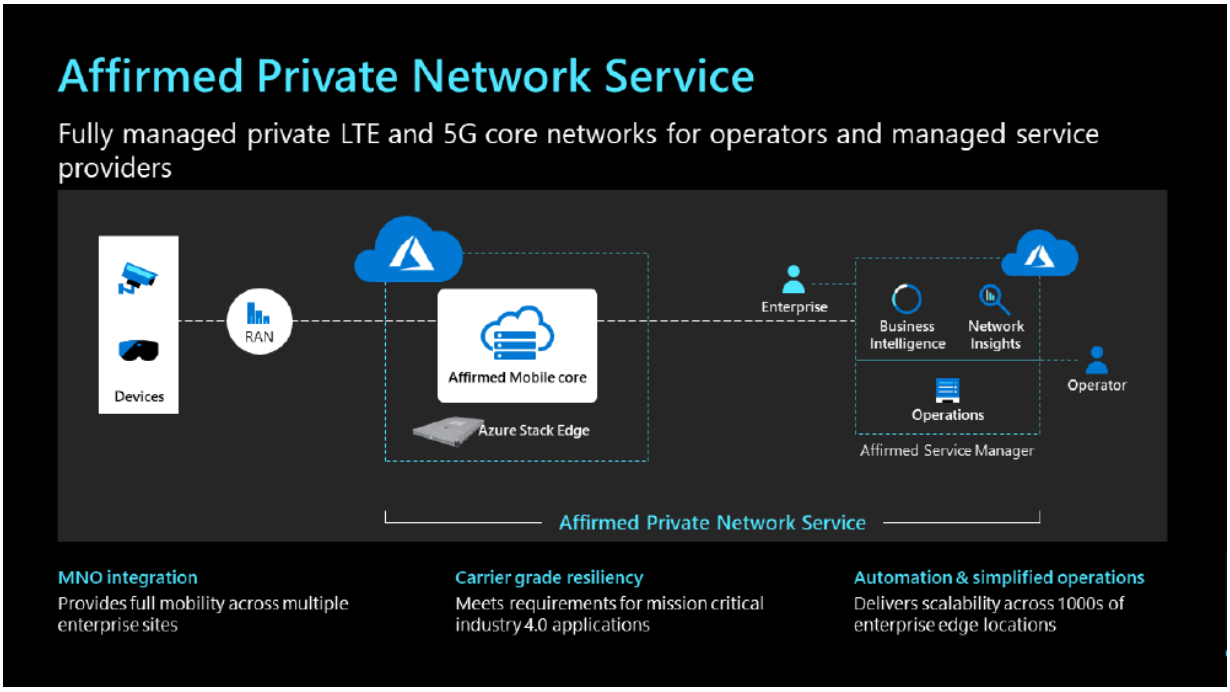


Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) at 2 (showing that Defendants' offering of APNS including Affirmed Mobile Core is hosted on Defendants' servers).

62. Defendants offer multiple options for deploying the core network in APNS, including: (1) on dedicated hardware at the edge, including running on ASE hardware; (2) all running in the cloud (Azure Cloud) with no functionality running on hardware at the edge; and (3) a hybrid where the control plane is run in the cloud (Azure Cloud) and the user-plane is run at the edge (ASE). Exhibit 10 at 17 ("Affirmed Mobile Core ensures that the solution can be deployed in several different ways: as a standalone edge in an isolated environment, in distributed mode by centralizing the control plane on Azure cloud and distributing the user plane on Azure Stack Edge, and fully-hosted on Azure cloud.").

63. **Azure Stack Edge.** Affirmed Mobile Core is software that performs core network (4G/5G) functions. In APNS, that software functionality is either run on Azure Stack Edge servers ("ASE") or in the Azure Cloud (cloud-based Azure servers operated by

Microsoft). The Azure Stack Edge is the server hardware that runs Affirmed Mobile Core in an APNS bundle. Exhibit 10 at 12 ("Azure Stack Edge provides a single point for processing mobile network data at the edge."). ASE include Azure Stack Edge Pro and Azure Stack Edge Pro 2 options. Exhibit 21 at 2 (Azure Stack Edge Pro is a "1U rack mount server" from Microsoft, managed from the cloud). *Id.* at 2; Exhibit 22 (Part 1) at 13 (Azure Stack Edge Pro 2 is a rack-mounted server with "multiple models that closely align with your compute, storage, and memory needs," just as the Azure Stack Edge Pro).

DEFENDANTS' KNOWLEDGE OF THEIR INFRINGEMENT

64. Defendants have had knowledge of the Asserted Patents and of their infringement based on a number of facts. Lemko served Defendants with its original patent infringement complaint on February 16, 2022. Lemko's original complaint identified the Asserted Patents by number, identified the products by name that infringe the Asserted Patents, and stated that Defendants were infringing the Asserted Patents, which is sufficient to put Defendants on notice of their infringement of the Asserted Patents and to establish Defendants' awareness of the Asserted Patents.

65. Other facts further demonstrate that Defendants also have knowledge of the Asserted Patents and which products are alleged to be infringed based on their receipt of Lemko's Preliminary Infringement Contentions served on December 20, 2022, and Lemko's First Amended Complaint on October 19, 2023 (Doc 59). Both Lemko's Preliminary Infringement Contentions and its First Amended Complaint also identify the Asserted Patents by patent number, identify the Accused Products by name, and state that Defendants are infringing, which is sufficient to put Defendants on notice of their infringement of the Asserted Patents and sufficient grounds to establish Defendants' awareness of the Asserted Patents.

66. Lemko's Preliminary Infringement Contentions provide in detail and explain on an element-by-element basis how Defendants' Accused Products infringe each of the Asserted Patents. Exhibit 18 (Cover Pleading); Exhibit 19 (Chart A-1) (describing Defendants' infringement of the '763 Patent); Exhibit 24 (Chart B-1) (describing Defendants' infringement of the '414 Patent); Exhibit 29 (Chart C-1) (describing Defendants' infringement of the '988 Patent); Exhibit 30 (Chart D-1) (describing Defendants' infringement of the '409 Patent); Exhibit 34 (Chart E-1) (describing Defendants' infringement of the '111 Patent); Exhibit 35 (Chart F-1) (describing Defendants' infringement of the '980 Patent); Exhibit 38 (Chart G-1) (describing Defendants' infringement of the '478 Patent); Exhibit 39 (Chart H-1) (describing Defendants' infringement of the '931 Patent).[3]

67. On information and belief and based upon the publicly available information, Defendants have not taken any action to avoid infringing Lemko's Asserted Patents since they became aware of Lemko's Asserted Patents.

[3] Lemko attaches its Preliminary Infringement Contentions as Exhibits to this Second Amended Complaint for the purpose of establishing the notice it already provided to Defendants regarding their infringement of the Asserted Patents and that Defendants were aware of Lemko's Asserted Patents, the Accused Products at issue, and the nature of Lemko's allegations of infringement. Lemko prepared its Preliminary Infringement Contentions based on the publicly available information available to Lemko in December 2022. Lemko will serve updated Preliminary Infringement Contentions when the stay on discovery in this case is lifted. Lemko will serve Final Infringement Contentions 30 days after fact discovery closes in this case, in compliance with the parties' Joint Case Management Report. Doc. 69.

COUNT I
(Direct Infringement of the '763 Patent)

68. Lemko repeats, realleges, and incorporates by reference, as if fully set forth herein, the allegations of the preceding paragraphs, as set forth above.

69. In violation of 35 U.S.C. § 271(a), Defendants directly infringe at least exemplary Claim 1 of the '763 Patent by making, using, importing, selling, and offering for sale in the United States at least Affirmed Mobile Core without the permission, consent, authorization, or license of Lemko.

70. Defendants' infringement is based upon literal infringement or, at the very least, infringement under the doctrine of equivalents.

71. Defendants are the final assembler of the infringing system because they provide the Affirmed Mobile Core service. Defendants provide, install, and configure the Affirmed Mobile Core software on servers and connect those servers to base transceiver stations, such as eNodeBs (as discussed below), thereby making the infringing system. Further evidence that Defendants are the final assembler of the infringing network is that they sell and offer for sale Affirmed Mobile Core as a paid service for their customers. In that scenario, Defendants own and operate the servers that run the Affirmed Mobile Core software for their customers' networks, install the software on their servers, configure the software, and connect the servers running the Affirmed Mobile Core software to their customers' BTSs, such as eNodeBs. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) shows that Defendants offer and sell the service of configuring and operating Affirmed Mobile Core as a service for their customers.

72. Microsoft and Affirmed Networks directly infringe by operating as a joint enterprise with respect to making, using, importing, selling, and offering for sale Affirmed

Mobile Core. Affirmed Networks is a subsidiary of Microsoft, and Defendants cooperate to make, use, market, sell and offer for sale Affirmed Mobile Core by itself, and Affirmed Mobile Core in combination with Microsoft ASE servers. Defendants together provide the services of managing and configuring the APNS solution, which includes Affirmed Mobile Core. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) at 1-2.

73. Defendants further directly infringe by directing and controlling the infringing systems, and obtaining benefits from their control of the systems as a whole when Defendants configure and maintain the infringing systems as a paid service for their customers. Under this scenario, discussed above, Defendants provide Affirmed Mobile Core in combination with Microsoft Azure's capabilities to make a network that Microsoft manages, and thereby controls, as a service for mobile network operators and other customers. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) at 1.

74. Affirmed Mobile Core meets all of the limitations of Claim 1 of the '763 Patent.

75. **A system comprising a first DMA server and a second DMA server.** An installation of Affirmed Mobile Core at multiple locations will involve multiple instances of Affirmed Mobile Core, each of which has a Serving Gateway ("SGW") and a Packet Data Network Gateway ("PGW"). Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 1, 3 (vEPC, which is Affirmed Mobile Core, includes SSGN, MME, GGSN, SGW, and PGW software to support network services for 2G, 3G, 4G, LTE, and VoLTE on a 3GPP[4] standard-

[4] The 3rd Generation Partnership Project ("3GPP") specifications cover mobile telecommunications technologies, including radio access, core networks, and service capabilities, which provide "a complete system description for mobile telecommunications." Exhibit 46 (3GPP.pdf) at 1. 3GPP has become an international standards project. *Id*. at 4. Because of the international standardization, Affirmed Mobile Core software follows the standard-based open architecture in 3GPP projects to provide 3GPP compliant network functions (e.g., SGSN, MME, GGSN, SGW, and PGW) to connect mobile calls and route the

based open architecture). Each Affirmed Mobile Core instance operates as a DMA server with an SGW and a PGW. Therefore, the system includes a first DMA server from a first Affirmed Mobile Core instance and a second DMA server from a second Affirmed Mobile Core instance.

76. **A first and a second computer readable medium:** Affirmed Mobile Core is computer software that is stored on server memory, which is a computer readable medium. The computer software for the SGW and the PGW, stored on server memory, is the first and second computer readable medium.

77. **A first and second mobile switching center module embedded in the first and the second computer readable medium:** Affirmed Mobile Core includes Mobility Management Entity ("MME") functionality, which is a mobile switching center module because it provides the functionality to manage mobile calls, such as managing mobile handovers and routing through the PGW selection. Affirmed Mobile Core's PGW software also handles IP address allocation, routing of data through the external network, packet filtering for inbound traffic charging functionality, and interfacing with the Policy and Charging Rules Function ("PCRF"), Online Charging System ("OCS"), and Off-line Charging System ("OFCS"), which are additional mobile switching center functionalities. Affirmed Mobile Core's SGW software handles call routing and switching and routes packets to the appropriate PGWs, which are also mobile switching center functionalities. The MME functionality is included at both the SGW and PGW. Therefore, the first and second instance of Affirmed Mobile Core have a first and second mobile switching center module embedded in

calls in 2G, 3G, 4G, LTE, and VoLTE mobile networks. Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 1, 3.

the first and second computer readable medium (the software for the SGW and PGW stored in server memory).

78. **A first and second base station controller module embedded in the first and second computer readable medium:** Affirmed Mobile Core software includes functionality for base station control (BSC) operations. The software providing that functionality is a base station controller module. The MME connecting to the SGW and the PGW handles resource management, handovers, and traffic management with a direct role in evolved packet system bearer establishment, which are base station control operations (and, therefore, part of the base station controller module). In addition, Affirmed Mobile Core's PGW is involved with the establishment and application of EPS bearers, which incorporates both resource and traffic management with functionalities such as packet filtering, which are further base station controller module operations. As described above, the Affirmed Mobile Core software, which include base station controller modules, is embedded in the first and second computer readable medium.

79. **A first and second call detail record (CDR) generation program embedded in the first and second computer readable medium:** Affirmed Mobile Core's SGW and PGW modules generate call detail records (CDRs) for offline charging and inter-operator charging and, therefore, include CDR generation programs. Exhibit 40 at 1-7 – 1-8; Exhibit 25 at 1-2.[5] Affirmed Mobile Core's PGW and SGW connect to the PCRF (Policy and Charging

[5] Exhibit 25 is a manual for Mobile Content Cloud, which provides virtualized EPC (vEPC) functionalities. Exhibit 25 at 1-2 ("The Affirmed Networks Mobile Content Cloud is a virtualized EPC (vEPC) . . . solution"). As discussed above, Defendants previously marketed their mobile core software as vEPC, and now market it as Affirmed Mobile Core and Affirmed Mobile Content Cloud. Exhibit 13 (Affirmed Intel vEPC Performance Report.pdf) at 1, 2 ("Affirmed Mobile Content Cloud (MCC) . . . offers . . . vEPC functionality" and describing tests of Affirmed Mobile Core as testing of Affirmed vEPC). As shown in the manual, the

Rules Function), which enables service flow-based charging, which is a further CDR generation functionality. Affirmed Mobile Core's PGW also connects to the Online Charging System (OCS) and Off-line Charging System (OFCS), which support charging of end-users, which is another CDR generation functionality. As described above, the Affirmed Mobile Core SGW and PGW, which include these CDR generation programs, are embedded in the first and second computer readable medium.

4.2 Architecture reference model

4.2.1 Non-roaming architecture

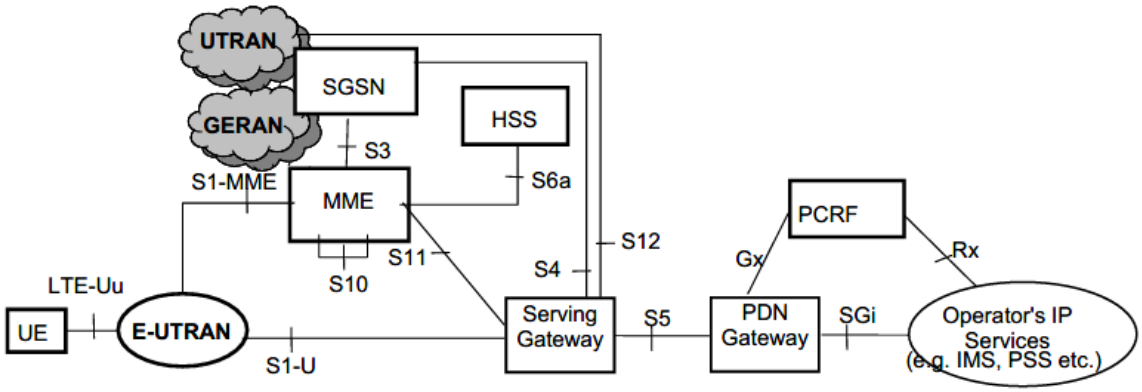


Figure 4.2.1-1: Non-roaming architecture for 3GPP accesses

Exhibit 41 (3GPP_TS_23.401.pdf) at 16 (showing the connection between SGW, PGW, and PCRF in Affirmed Mobile Core);[6] Exhibit 15 (Virtual Evolved Packet Core (vEPC)

Affirmed Mobile Core software (referred to as Mobile Content Cloud) is 3GPP compliant. Exhibit 25 at 1-16. This includes providing SGSN, MME, GGSN, SGW and PGW functionality to support network services in 2G, 3G, 4G, LTE, and VoLTE mobile networks. *Id.*; Exhibit 46 (3GPP.pdf) at 1 (3GPP specifications cover cellular telecommunications technologies).

[6] Exhibit 41 (3GPP_TS_23.401.pdf) describes the 3GPP standard, including its functionality for roaming and non-roaming scenarios and covers mobility between 3GPP radio access technologies, policy control, charging, and authentication. Exhibit 41 (3GPP_TS_23.401.pdf) at 10-11. Affirmed Mobile Core is 3GPP complaint, meaning that it provides the functionality described in the 3GPP standard. Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 3 (describing its 3GPP compliance).

Solution.pdf) at 1, 3 (vEPC, which is Affirmed Mobile Core, provides a 3GPP compliant open architecture including SGSN, MME, GGSN, SGW, and PGW modules).

80. **Wherein the first and second DMA servers are in direct physical connection with a first and second wireless transceiver:** The only requirement of Claim 1 with respect to the wireless transceiver is that the servers are ***connected*** to a wireless transceiver. Affirmed Mobile Core includes a direct S1 interface connection (a physical connection) to the eNodeB module, which is a wireless transceiver. Affirmed Mobile Core's MME connects to the E-UTRAN (which has a wireless transceiver) through the S1-MME interface, a direct physical connection, and its SGW connects to the E-UTRAN through the S1-U interface, another direct physical connection. These connections satisfy the limitation relating to the transceiver.

4.2 Architecture reference model

4.2.1 Non-roaming architecture

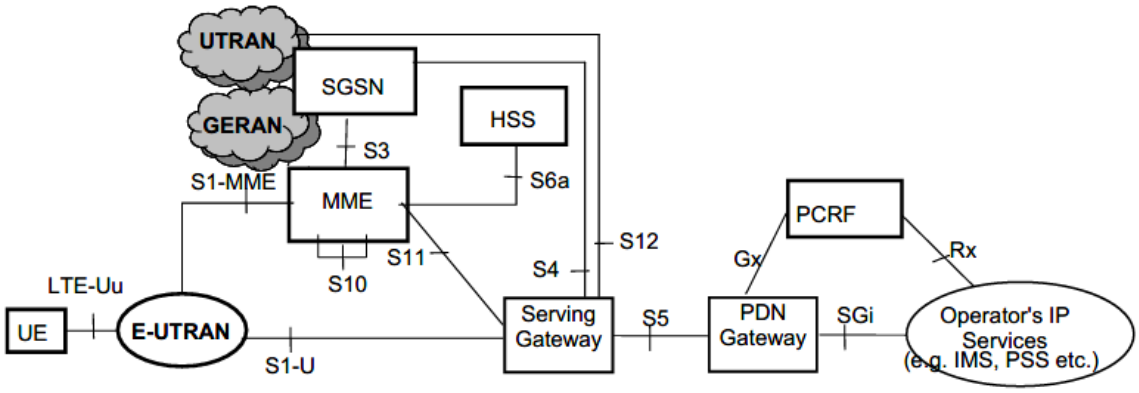


Figure 4.2.1-1: Non-roaming architecture for 3GPP accesses

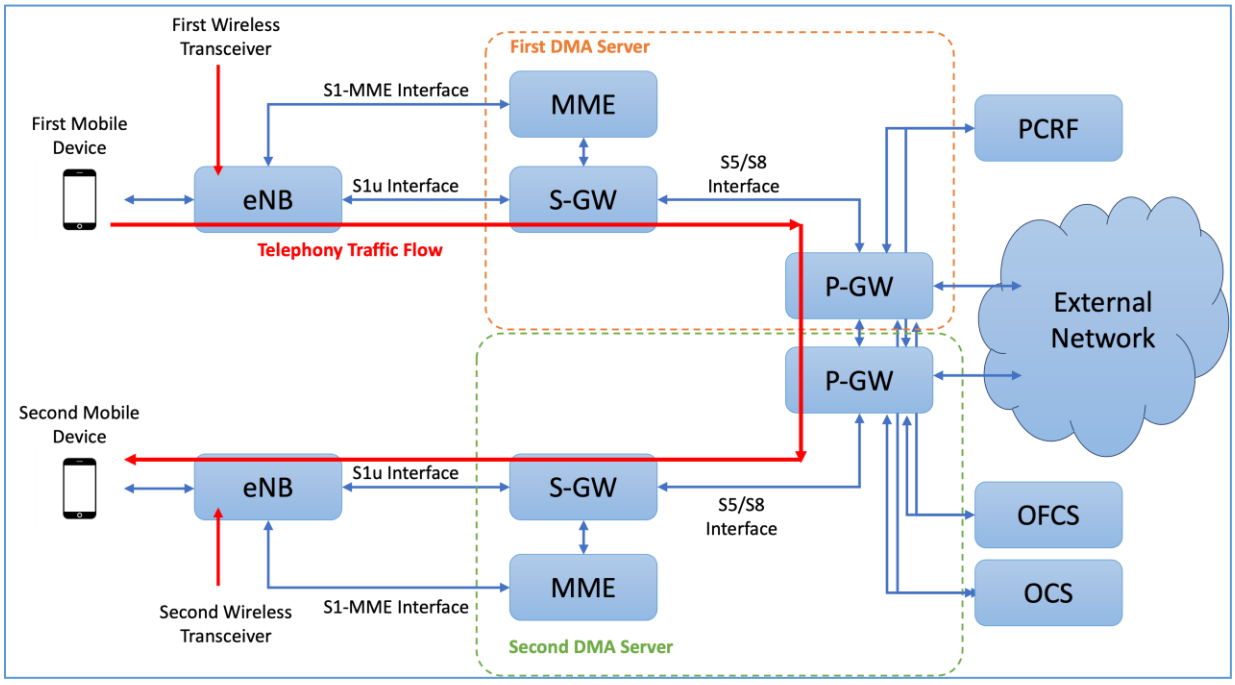
Exhibit 41 (3GPP_TS_23.401.pdf) at 16 (showing the S1-U interface, which is a direct physical connection between the DMA servers (SGW and MME) and the wireless transceiver for the E-UTRAN network); Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at

1, 3 (vEPC, which is Affirmed Mobile Core, supports 3GPP compliant open architecture including SGSN, MME, GGSN, SGW, and PGW).

81. **A program to allow a group call among four or more mobile communication devices, embedded in the second computer readable medium**: Affirmed Mobile Core enables group calls among four or more mobile communication devices. Because this functionality is part of Affirmed Mobile Core software, it is software included (embedded) in the second computer readable medium which stores the Affirmed Mobile Core software. Affirmed Mobile Core supports Voice over Long Term Evolution ("VoLTE"). VoLTE includes the ability to allow group calling between multiple communication devices, including four or more mobile communication devices. The VoLTE functionality provided by Affirmed Mobile Core also supports emergency call handling on SGW and PGW for group emergency communications among multiple mobile devices identified by their International Mobile Equipment Identity ("IMEI"), establishing a dedicated bearer for the emergency communications or emergency communications session according to the Quality of Service Class Identifier assigned by the network. Exhibit 25 at 7-10.

82. **Telephony traffic received at the first wireless transceiver of the first DMA server is transmitted from the first DMA server to the second DMA server via a peer-to-peer connection**: Affirmed Mobile Core transmits traffic received at the wireless transceiver of the first SGW (part of the first DMA server) from a mobile device that is originating the call. Affirmed Mobile Core has a "hair-pinning" feature, which refers to a networking technique where a device on a private network attempts to communicate with another mobile device on the same private network by using a public IP address. Instead of routing the packets for the call through the public Internet, the traffic make a "hair-pin turn" and comes

back to the target device on the same private network. The traffic is routed through a first PGW to a second SGW (part of the second DMA server), then to a second wireless transceiver, and finally to the target mobile device. The connections between the SGW and the PGW (the S5/S8 interface) and between PGWs are IP peer-to-peer connections so that the telephony traffic received at the first wireless transceiver of the first DMA server is transmitted to the second DMA server via a peer-to-peer connection.



The above schematic diagram was created as a demonstrative to illustrate this flow through the first wireless transceiver to the first DMA server, and to the second wireless transceiver and the second DMA server through a peer-to-peer connection.

83. Affirmed Mobile Core is operated in connection with the wireless transceiver element of the eNodeB module, which is required for connections to mobile devices. An eNodeB is "a logical network component which serves one or more E-UTRAN cells . . . . The Evolved UTRAN (E-UTRAN) consists of eNodeBs, providing the E-UTRA user plane (PDCP/RLC/MAC/PHY) and control plane (RRC) protocol terminations towards the [mobile

device] . . . ." Exhibit 23 at 33.[7] The eNodeBs are connected by means of the S1 interface to the EPC, more specifically to MME by means of the S1-MME interface and to the SGW by means of the S1-U interface. *Id*. This happens when Defendants use Affirmed Mobile Core, which can occur in multiple scenarios, including when there is product testing and development, and when Defendants' customers use Affirmed Mobile Core.

84. Defendants' infringement of the '763 Patent has injured and continues to injure Lemko in an amount to be proven at trial, but not less than a reasonable royalty. Defendants' infringement has caused and is continuing to cause irreparable injury to Lemko, and Lemko will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by this Court.

85. Pursuant to 35 U.S.C. §§ 283, 284, and 285, Lemko is entitled to injunctive relief, damages, and attorney's fees and costs.

COUNT II
(Indirect Infringement of the '763 Patent)

86. Lemko repeats, realleges, and incorporates by reference, as if fully set forth herein, the allegations of the preceding paragraphs.

87. Defendants' customers directly infringe the '763 Patent when they use or assemble Affirmed Mobile Core as an operating network, for example by installing the Affirmed Mobile Core software on servers and connecting those servers to BTSs, thereby making an infringing network. Defendants have induced and contributed to their customers'

[7] The Affirmed Mobile Core software is compliant with this technical specification produced by the 3GPP project. Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 1, 3 (describing 3GPP compliance); Exhibit 23 at 10 (3GPP Technical Specification). The 3GPP Specification covers architectures of the 3GPP system including UTRAN and GERAN radio access technologies, IP Multimedia Subsystem ("IMS"), and interworking between IMS and Circuit Switched systems. Exhibit 23 at 10.

direct infringement of the ’763 Patent under 35 U.S.C. § 271(b) by instructing and encouraging their customers infringing use and making of Affirmed Mobile Core as a system infringing at least exemplary Claim 1.

88. Defendants know about the ’763 Patent and that Affirmed Mobile Core infringes the ‘763 Patent, at least from their receipt of Lemko’s February 14, 2022 Complaint, December 20, 2022 Preliminary Infringement Contentions, and October 19, 2023 First Amended Complaint.

89. Lemko’s Complaint specifically identifies the Asserted Patents and the Accused Products, states that Defendants are infringing, and explains Defendants’ infringement of the ‘763 Patent. Doc. 1 at ¶¶ 51-76.

90. Lemko’s First Amended Complaint again specifically identifies the Asserted Patents and the Accused Products, states that Defendants are infringing, and explains Defendants’ infringement of the ‘763 Patent. Doc. 59 at ¶¶ 79-96.

91. Appx. A-1 to Lemko’s Preliminary Infringement Contentions, Exhibit 19 hereto, provides a detailed disclosure of Defendants’ infringement of the ‘763 Patent.

92. This Second Amended Complaint further places Defendants on specific notice that they are infringing and contributing to and inducing customers’ infringement of the ‘763 Patent.

93. Defendants knowingly and actively aided and abetted their customers’ direct infringement of the ’763 Patent. As discussed above, Affirmed Mobile Core infringes the ’763 Patent by providing MSC functionality, BSC functionality, CDR generation functionality, and group call functionality. Defendants instruct and encourage their customers on how to use each of these important features of Affirmed Mobile Core, including through trainings,

reference materials, user manuals, user guides, promotional materials, and by providing customer support, which are all intended to enable and encourage customers' purchase, installation, and use of Affirmed Mobile Core, including its MSC, BSC, CDR generation, and group call functionality. For example, Defendants publish a variety of product documents that that describe functionality of Affirmed Mobile Core. *See, e.g.*, Exhibit 31, (https://www.affirmednetworks.com/asset-type/white-papers/) (listing Affirmed Networks white papers). Defendants also provide product blog posts that cover Affirmed Mobile Core's infringing features and instruct customers on how to configure and use Affirmed Mobile Core. *See, e.g.*, Exhibit 32 (https://www.affirmednetworks.com/blog/) (listing Affirmed Networks blog posts, including on vEPC, which is now Affirmed Mobile Core).

94. In addition, Defendants support customers' use and configuration of Affirmed Mobile Core through a dedicated support center. Exhibit 33 (https://www.affirmednetworks.com/support/) ("Affirmed Networks' 24/7/365 global support team ensures rapid response times to assist communication service providers (CSPs) no matter where they are in their virtualization journey, from initial network design to system integration and post-production support, for 2G, 3G, 4G, and 5G networks.").

95. In addition, Defendants operate an online site called "Azure Community Support," with discussions and articles covering the use of ASE servers, which are used with Affirmed Mobile Core in an infringing manner (as described above). Exhibit 42 (https://azure.microsoft.com/en-us/support/community/). Azure Community Support provides in-depth instructions for installing and configuring ASE servers.

96. Defendants are also liable for contributory infringement of the '763 Patent pursuant to 35 U.S.C. § 271(c) by knowing or being willfully blind to the fact that they are

contributing to their customers' infringement of at least exemplary Claim 1 by offering to sell and selling Affirmed Mobile Core in the United States. The Affirmed Mobile Core software that Defendants provide is, at a minimum, a material component of the system that infringes Claim 1 of the '763 Patent.

97. Affirmed Mobile Core is not a staple article or commodity of commerce suitable for substantial noninfringing use. The function of Affirmed Mobile Core is to provide the accused mobile networks, which infringe when they operate as described above for Count I, and they have no purpose other than to be use to provide the accused mobile networks. Defendants therefore know or are willfully blind to the fact that they are contributing to their customers' infringement of the '763 Patent, including Claim 1.

98. Defendants' indirect infringement of the '763 Patent has injured and continues to injure Lemko in an amount to be proven at trial, but not less than a reasonable royalty. Lemko will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by the Court.

99. Pursuant to 35 U.S.C. §§ 283, 284, and 285, Lemko is entitled to injunctive relief, damages, and attorney's fees and costs.

COUNT III
(Direct Infringement of the '414 Patent)

100. Lemko repeats, realleges, and incorporates by reference, as if fully set forth herein, the allegations of the preceding paragraphs, as set forth above.

101. In violation of 35 U.S.C. § 271(a), Defendants directly infringe at least exemplary Claim 8 of the '414 Patent by making, using, importing, selling, and offering for sale in the United States at least Affirmed Mobile Core, which performs the claim method, without the permission, consent, authorization, or license of Lemko.

102. Defendants' infringement is based upon literal infringement or, at the very least, infringement under the doctrine of equivalents.

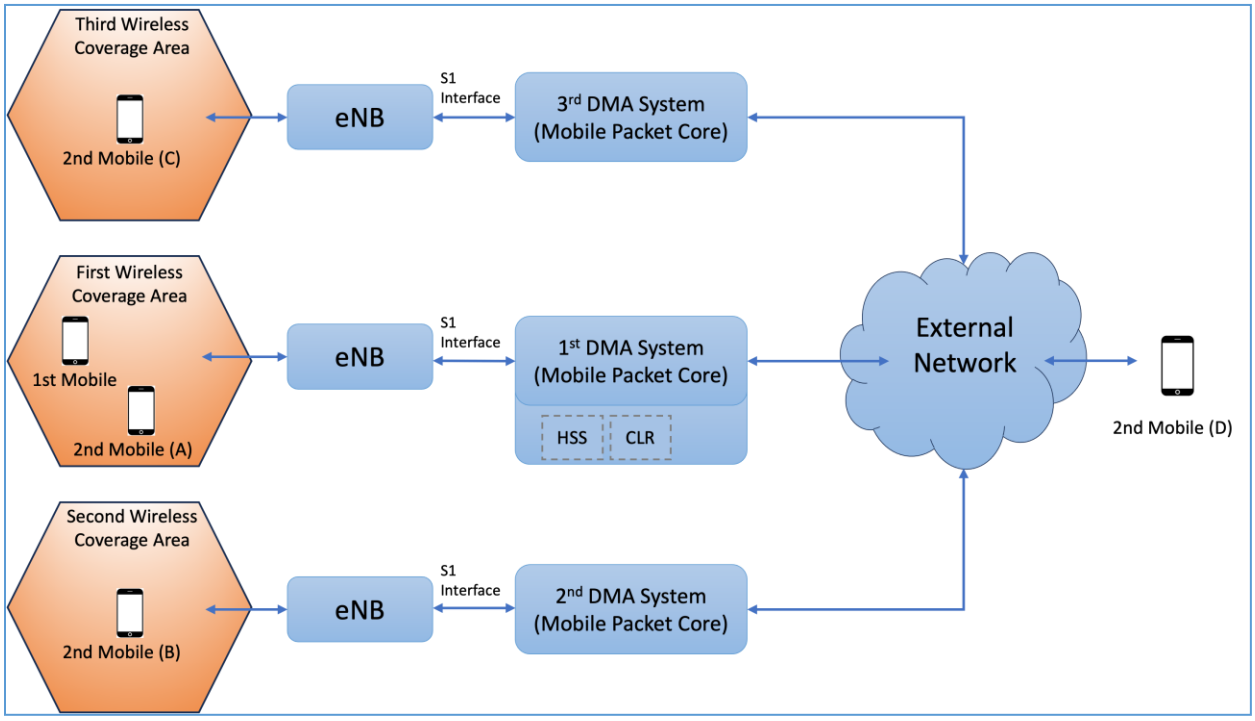
103. Defendants are the final assembler of the system that performs the infringing method because they provide the Affirmed Mobile Core service. Defendants provide, install, and configure the Affirmed Mobile Core software on servers and connect those servers to base transceiver stations, such as eNodeBs (as discussed below), thereby making the infringing system. Further evidence that Defendants are the final assembler of the infringing network is that they sell and offer for sale Affirmed Mobile Core as a paid service for their customers. In that scenario, Defendants own and operate the servers that run the Affirmed Mobile Core software for their customers' networks, install the software on their servers, configure the software, and connect the servers running the Affirmed Mobile Core software to their customers' BTSs, such as eNodeBs. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) shows that Defendants offer and sell the service of configuring and operating Affirmed Mobile Core as a service for their customers.

104. Microsoft and Affirmed Networks directly infringe by operating as a joint enterprise with respect to making, using, importing, selling, and offering for sale Affirmed Mobile Core. Affirmed Networks is a subsidiary of Microsoft, and Defendants cooperate to make, use, market, sell and offer for sale Affirmed Mobile Core by itself, and Affirmed Mobile Core in combination with Microsoft ASE servers. Defendants together provide the services of managing and configuring the APNS solution, which includes Affirmed Mobile Core. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) at 1-2.

105. Defendants further directly infringe by directing and controlling the infringing systems, and obtaining benefits from their control of the systems as a whole when Defendants

configure and maintain the infringing systems as a paid service for their customers. Under this scenario, discussed above, Defendants provide Affirmed Mobile Core in combination with Microsoft Azure's capabilities to make a network that Microsoft manages, and thereby controls, as a service for mobile network operators and other customers. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) at 1.

106. Affirmed Mobile Core infringes at least Claim 8 of the '414 Patent by providing functionality to enable a first mobile device in a first wireless coverage area to initiate a call to a second mobile device, which can be in one of four different locations: (a) in the first wireless coverage area, (b) in the second wireless coverage area, (c) in the third wireless coverage area, or (d) in none of the first, the second, or the third wireless coverage area.



The above schematic diagram was created as a demonstrative to illustrate the call path between the first and the second mobile devices in the first, second, or third wireless coverage area scenarios.

107. As shown below, Affirmed Mobile Core meets all of the limitations of the method of Claim 8 of the '414 Patent.

108. **A method to receive at a first DMA system of a DMA network, a call from a first mobile subscriber to a second mobile subscriber**: Affirmed Mobile Core is software that performs each step of Claim 8 in order to receive a call from a mobile device (the first mobile subscriber) that is directed to a different mobile device (the second mobile subscriber). As discussed below, Affirmed Mobile Core forms a DMA network of nodes, which are DMA systems. The node receiving the call from the first mobile subscriber is the first DMA system of the DMA network. Each DMA system uses "Voice-over-IP (VoIP) implementation based on a 3GPP standardized implementation of Session Initiation Protocol ("SIP"), and runs over the standard Internet Protocol ("IP")." Exhibit 27 at 125.[8] Affirmed Mobile Core can also receive a call from a first mobile subscriber to a second mobile subscriber in packet-switch domain from "LTE coverage" at a first DMA system and moves the call to "a legacy circuit domain" through Single Radio Voice Call Continuity ("SRVCC"). Exhibit 27 at 58.

109. **The DMA network includes at least the first DMA system, a second DMA system, and a third DMA system**: Affirmed Mobile Core includes the SGW and PGW modules, which are DMA systems in a DMA network. An installation of Affirmed Mobile Core with multiple nodes will have multiple instances of the Affirmed Mobile Core software, with each being a DMA system. The DMA network can include a first, a second, and a third DMA system that each include SGWs and PGWs. SGWs and PGWs are connected by peer-to-

[8] This document (Affirmed Networks vMME Operator Guide) provides configuration procedures for the MME and the SGSN in vEPC. Exhibit 27 at 1. As discussed above, Defendants now market vEPC as Affirmed Mobile Core.

peer connections (as discussed below) in order to form a DMA network, which can be a GSM, LTE, or 5G network.

110. There is a single SGW connecting to a mobile device at a given time, but multiple PGWs can be connecting to a mobile device at the same time. Exhibit 23 at 29.[9] PGWs and SGWs connect through S5/S8 interfaces. Exhibit 23 at 73 (the S5 and S8 interfaces are between SGWs and PGWs, which provides functions for packet data services towards end users during roaming and non-roaming cases). SGWs transmit and receive data packets "from the *Enhanced Universal Terrestrial Radio Access Network* (EUTRAN) to/from the PDN gateway and acts as a demarcation point between the RAN network and core network." Exhibit 25 at 7-7;[10] Exhibit 23 at 29 (SGW is the gateway that terminates the interface towards E-UTRAN). SGWs route and forward packets, and act as the local mobility anchor point for "inter-eNodeB handover." Exhibit 43 (3GPP_TS_23.003.pdf) at 29. PGWs route the packets to and from the packet data network, serving as points of interconnect between Affirmed Mobile Core and the external IP networks to a mobile device. Exhibit 23 at 29 (PGW is the

[9] This technical specification is produced by 3GPP. Exhibit 23 at 10. It presents the architecture and support for radio access technologies (UTRAN, GERAN, and E-UTRAN). *Id.* It describes architecture for IP Multimedia Subsystem ("IMS") and fixed broadband and interworking and session continuity between IMS and circuit switched systems. *Id.*

[10] Exhibit 25 is a manual for Mobile Content Cloud, which provides virtualized EPC (vEPC) functionalities. Exhibit 25 at 1-2 ("The Affirmed Networks Mobile Content Cloud is a virtualized EPC (vEPC) . . . solution"). As discussed above, Defendants previously marketed their mobile core software as vEPC, and now market it as Affirmed Mobile Core and Affirmed Mobile Content Cloud. Exhibit 13 (Affirmed Intel vEPC Performance Report.pdf) at 1, 2 ("Affirmed Mobile Content Cloud (MCC) . . . offers . . . vEPC functionality" and describing tests of Affirmed Mobile Core as testing of Affirmed vEPC). As shown in the manual, the Affirmed Mobile Core software (referred to as Mobile Content Cloud) is 3GPP compliant. Exhibit 25 at 1-16. This includes providing SGSN, MME, GGSN, SGW and PGW functionality to support network services in 2G, 3G, 4G, LTE, and VoLTE mobile networks. *Id.*; Exhibit 46 (3GPP.pdf) at 1 (3GPP specifications cover cellular telecommunications technologies).

gateway that terminates the SGi interface towards the packet network). PGWs also support non-3GPP access networks, as shown below. *Id*. at 30.

The PDN GW functions also includes user plane anchor for mobility between 3GPP access and non-3GPP access. It supports:

- A LMA function for PMIPv6, if PMIP-based S5 or S8, or if S2a or PMIP based S2b is used;
- A DSMIPv6 Home Agent, if S2c is used;
- Allocation of GRE key, which is used to encapsulate uplink traffic to the PDN GW on the PMIP-based S5/S8, or S2a or PMIP based S2b interface;
- A MIPV4 Home Agent, if S2a with MIPv4 FA CoA mode is used.
- GPRS Tunnelling Protocol for the control plane and the user plane to provide PDN connectivity to UEs using non-3GPP accesses, if GTP based S2b is used.

Id. (explaining PGW's support between 3GPP and non-3GPP access).

111. Affirmed Mobile Core in the first, the second, and the third DMA systems uses the S1-U interface for connecting to the eNodeB. Exhibit 40 at 1-3. Outbound calls from a mobile device connected to E-UTRAN via the base station are received at the SGW of the first or the second DMA system over the S1-U interface. The inbound calls from a mobile device to a device attached to E-UTRAN come into the first or the second DMA system through PGW via the SGi interface, connecting to the operator's networks. The SGW together with PGW constitute the "user plane."

4.2.1 Non-roaming architecture

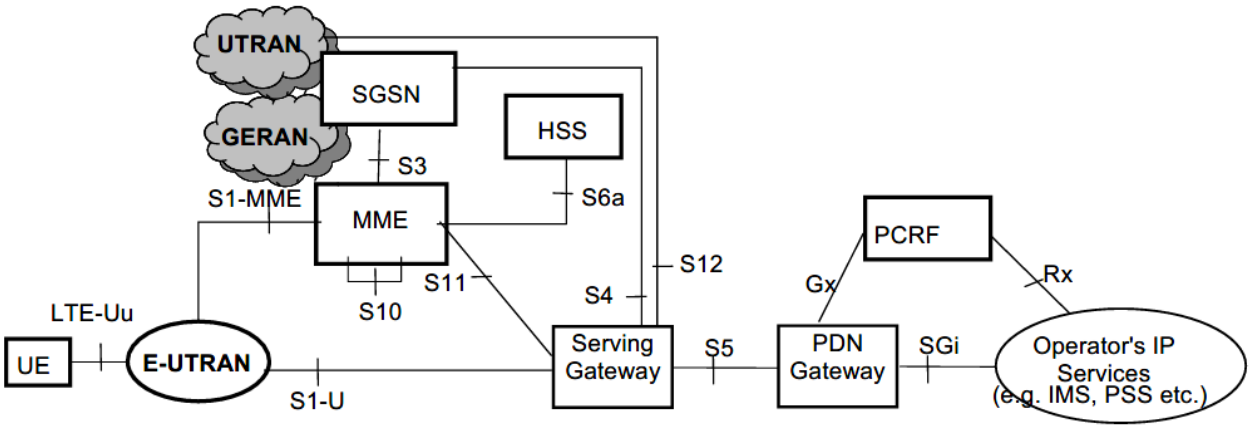


Figure 4.2.1-1: Non-roaming architecture for 3GPP accesses

Exhibit 41 (3GPP_TS_23.401.pdf) at 16 (showing S1-U interface for connecting E-UTRAN and SGW, and SGi interface for connecting PGW and external network);[11] Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 1, 3 (vEPC, which is Affirmed Mobile Core, supports 3GPP compliant open architecture including SGSN, MME, GGSN, SGW, and PGW).

112. **Determining whether the second mobile subscriber is located within a first wireless coverage area of the DMA network that is associated with the first DMA system based on information stored at an HLR and a VLR of the first DMA system**: Affirmed Mobile Core includes an HLR module and a VLR module at each node (including in the first DMA system) to store the mobile subscribers registered with the first DMA system. The HLR identifies authorized subscribers associated with (in range of) a specific node (DMA system) and the VLR identifies the mobile subscribers who are roaming in the vicinity of and reachable through a specific node. Through the HLR and the VLR, Affirmed Mobile Core determines if the second mobile subscriber is located in the DMA network associated with the first DMA system or roaming in the wireless coverage area of the DMA network. Specifically, the HLR/HSS module stores the subscriber types to identify if the second subscriber is roaming/visiting in the DMA network. Exhibit 25 at 7-26 (based on the peer's status and the subscriber's home/visiting status, a subscriber is classified as "Home, Roam-in, or Roam-out.").

[11] Exhibit 41 (3GPP_TS_23.401.pdf) describes the 3GPP standard, including its functionality for roaming and non-roaming scenarios and covers mobility between 3GPP radio access technologies, policy control, charging, and authentication. Exhibit 41 (3GPP_TS_23.401.pdf) at 10-11. Affirmed Mobile Core is 3GPP complaint, meaning that it provides the functionality described in the 3GPP standard. Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 3 (describing its 3GPP compliance).

113. The Affirmed Mobile Core HSS module is the master database for a given user. Exhibit 23 at 20; Exhibit 27 at 61-62 (HSS/HLR stores service area identifier and tracking area identifier). The HSS is responsible for user identification, user location information, and user profile information. Exhibit 23 at 20-21.

114. When a mobile subscriber enters a new location area, its mobile device starts a registration procedure. Exhibit 47 (3GPP_TS_23.002.pdf) at 23.[12] The mobile control center notices this registration and transfers to a VLR the identity of the location area where the mobile subscriber is situated. *Id.* If this mobile subscriber's device is not already registered in the VLR, the VLR and the HLR exchange information to allow the proper handling of circuit switch calls. *Id.* A VLR may be in charge of more than one MSC area. *Id.*

115. **When the second mobile subscriber is located within the first wireless coverage area, connecting the call to the second mobile subscriber via the first DMA system**: The SGW and the PGW modules of the first node (the first DMA system) are the "user plane" which provides the functions of routing and transporting call data including connecting the call to the second mobile subscriber when the second mobile subscriber is located within the first wireless coverage area. The data packets flow from mobile device to the eNodeB, and the SGW to the PGW, and the PGW to packet data network through the SGi interface. Exhibit 41 (3GPP_TS_23.401.pdf) at 71.

116. **When the second mobile subscriber is not located within the first wireless coverage area, determining whether the second mobile subscriber is located within a**

[12] This specification is produced by 3GPP. Exhibit 47 (3GPP_TS_29.274.pdf) at 10. It presents the architecture for UTRAN and GERAN radio access technologies. *Id.* It also presents the architecture for the IP Multimedia Subsystem ("IMS") and interworking and session continuity between the IMS and circuit switched systems.

second wireless coverage area of the DMA network that is associated with the second DMA system based on information from a CLR (stored at the first DMA system) associated with the second DMA system: Affirmed Mobile Core includes a CLR module, which is a mobile device pool used for the hair-pinning feature stored in the first DMA system. Exhibit 40 (MCC_Manual.pdf) at 7-12. In this scenario, the mobile device pool (CLR) in the first DMA system allows the traffic to hairpin locally from the mobile device of the first mobile subscriber in the first DMA system to the mobile device of the second subscriber in the second DMA system. *Id*. The DMA system makes the decision to forward the call from the first mobile device based on the destination IP address in the received packet. *Id*. The destination IP address determines if the mobile device is the second subscriber within a second wireless coverage area of the DMA network that is associated with the second DMA system. If the mobile device of the second subscriber is in the mobile device pool, the first DMA system forwards the packet to the second subscriber's mobile device through the Gn interface. *Id*.

117. **When the second mobile subscriber is not located within the first wireless coverage area and is not located within the second wireless coverage area, determining whether the second mobile subscriber is located within a third wireless coverage area of the DMA network that is associated with the third DMA system based on information stored at a CLR associated with the third DMA system, wherein the CLR associated with the third DMA system is stored at the first DMA system**: Affirmed Mobile Core includes a CLR module, which is a mobile device pool used for the hair-pinning feature stored in the first DMA system. Exhibit 40 (MCC_Manual.pdf) at 7-12. In this scenario, the mobile device pool (CLR) in the first DMA system will allows the traffic to hairpin locally from the mobile device

of the first mobile subscriber in the first DMA system to the mobile device of the second subscriber in the third DMA system. *Id*. The DMA system makes the decision to forward the call from the first mobile device based on the destination IP address in the received packet. *Id*. The destination IP address determines if the second subscriber's mobile device is not within a second wireless coverage area of the DMA network and is within the third wireless coverage area of the DMA network associated with the third DMA system. If the mobile device of the second subscriber is in the mobile device pool, the first DMA system forwards the packet to the second subscriber's mobile device through the Gn interface. *Id*.

118. **When the second mobile subscriber is not located within any of the first wireless coverage area, the second wireless coverage area, and the third wireless coverage area, determining a preferred call path to route the call outside of the DMA network based on information stored at a destination preference register ("DPR"), stored at the first DMA system**: When the second mobile subscriber is not within the first, the second, or the third wireless coverage areas, it is therefore not in the DMA network, meaning it is not in the range of any of the Affirmed Mobile Core nodes. In this scenario, Affirmed Mobile Core determines a preferred call path stored by selecting a path store in a destination preference register (DPR) located in the first DMA system. The DPR functionality at the Affirmed Mobile Core node includes an APN (Access Point Name) selection profile, a workflow or data profile, and a splicing policy. The workflow or data profile, which is a DPR, enables operators to "customize the use of current services" including SGW, PGW, GGSN, online and offline charging, accounting, policy, and QoS while routing the call outside of the DMA network. Exhibit 25 at 10-2. The workflows use the subscriber analyzer to determine the preferred call path from the set of rules to "select the subscriber sessions to apply a specific services policy."

Id. at 10-4. As a result, the second mobile subscriber receives the call from the first mobile subscriber following a preferred call path based on a specific service policy.

119. Defendants' infringement of the '414 Patent has injured and continues to injure Lemko in an amount to be proven at trial, but not less than a reasonable royalty. Defendants' infringement has caused and is continuing to cause irreparable injury to Lemko, and Lemko will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by this Court.

120. Pursuant to 35 U.S.C. §§ 283, 284, and 285, Lemko is entitled to injunctive relief, damages, and attorney's fees and costs.

COUNT IV
(Indirect Infringement of the '414 Patent)

121. Lemko repeats, realleges, and incorporates by reference, as if fully set forth herein, the allegations of the preceding paragraphs.

122. Defendants' customers directly infringe the '414 Patent when they use or assemble Affirmed Mobile Core as an operating network, for example by installing the Affirmed Mobile Core software on servers and connecting those servers to BTSs, and thereby making an infringing network. Defendants have induced and contributed to their customers' direct infringement of the '414 Patent under 35 U.S.C. § 271(b) by instructing and encouraging their customers infringing use and making of Affirmed Mobile Core as a system performing the method of at least exemplary Claims 8.

123. Defendants know about the '414 Patent and that Affirmed Mobile Core infringes the '414 Patent, at least from their receipt of Lemko's February 14, 2022 Complaint, December 20, 2022 Preliminary Infringement Contentions, and October 19, 2023 First Amended Complaint.

124. Lemko's Complaint specifically identifies the Asserted Patents and the Accused Products, states that Defendants are infringing, and explains Defendants' infringement of the '414 Patent. Doc. 1 at ¶¶ 87-121.

125. Lemko's First Amended Complaint again specifically identifies the Asserted Patents and the Accused Products, states that Defendants are infringing, and explains Defendants' infringement of the '414 Patent. Doc. 59 at ¶¶ 107-135.

126. Appx. B-1 to Lemko's Preliminary Infringement Contentions, Exhibit 24 hereto, provides a detailed disclosure of Defendants' infringement of the '414 Patent.

127. This Second Amended Complaint further places Defendants on specific notice that they are infringing and contributing to and inducing customers' infringement of the '414 Patent.

128. Defendants knowingly and actively aided and abetted their customers' direct infringement of the '414 Patent. As discussed above, Affirmed Mobile Core infringes the '414 Patent by providing MME, SGW, and PGW modules and the functionality to route calls from a first mobile device to a second mobile device under different scenarios. Defendants instruct and encourage their customers on how to use each of these important features of Affirmed Mobile Core, including through trainings, reference materials, user manuals, user guides, promotional materials, and by providing customer support, which are all intended to enable and encourage customers' purchase, installation, and use of Affirmed Mobile Core, including MME, SGW, and PGW modules and the functionality to route calls from a first mobile device to a second mobile device under different scenarios. For example, Defendants publish a variety of product documents that that describe functionality of Affirmed Mobile Core. *See, e.g.*, Exhibit 31, (https://www.affirmednetworks.com/asset-type/white-papers/) (listing

Affirmed Networks white papers). Defendants also provide product blog posts that cover Affirmed Mobile Core's infringing features and instruct customers on how to configure and use Affirmed Mobile Core. *See, e.g.*, Exhibit 32 (https://www.affirmednetworks.com/blog/) (listing Affirmed Networks blog posts, including on vEPC, which is now Affirmed Mobile Core).

129. In addition, Defendants support customers' use and configuration of Affirmed Mobile Core through a dedicated support center. Exhibit 33 (https://www.affirmednetworks.com/support/) ("Affirmed Networks' 24/7/365 global support team ensures rapid response times to assist communication service providers (CSPs) no matter where they are in their virtualization journey, from initial network design to system integration and post-production support, for 2G, 3G, 4G, and 5G networks.").

130. In addition, Defendants operate an online site called "Azure Community Support," with discussions and articles covering the use of ASE servers, which are used with Affirmed Mobile Core in an infringing manner (as described above). Exhibit 42 (https://azure.microsoft.com/en-us/support/community/). Azure Community Support provides in-depth instructions for installing and configuring ASE servers.

131. Defendants are also liable for contributory infringement of the '414 Patent pursuant to 35 U.S.C. § 271(c) by knowing or being willfully blind to the fact that they are contributing to their customers' infringement of at least exemplary Claim 8 by offering to sell and selling in the United States Affirmed. The Affirmed Mobile Core software that Defendants provide is, at a minimum, a material component of the system that performs the method that infringes Claim 8 of the '414 Patent.

132. Affirmed Mobile Core is not a staple article or commodity of commerce suitable for substantial noninfringing use. The function of Affirmed Mobile Core is to provide the accused mobile networks, which infringe when they operate as described above for Count III, and they have no purpose other than to be use to provide the accused mobile networks. Defendants therefore know or are willfully blind to the fact that they are contributing to their customers' infringement of the '414 Patent, including Claim 8.

133. Defendants' indirect infringement of the '414 Patent has injured and continues to injure Lemko in an amount to be proven at trial, but not less than a reasonable royalty. Lemko will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by the Court.

134. Pursuant to 35 U.S.C. §§ 283, 284, and 285, Lemko is entitled to injunctive relief, damages, and attorney's fees and costs.

COUNT V
(Direct Infringement of the '988 Patent)

135. Lemko repeats, realleges, and incorporates by reference, as if fully set forth herein, the allegations of the preceding paragraphs, as set forth above.

136. In violation of 35 U.S.C. § 271(a), Defendants directly infringe at least exemplary Claim 42 of the '988 Patent by making, using, importing, selling, and offering for sale in the United States at least APNS without the permission, consent, authorization, or license of Lemko.

137. Defendants' infringement is based upon literal infringement or, at the very least, infringement under the doctrine of equivalents.

138. Defendants directly infringe by acting as the final assembler of the infringing system. Defendants are the final assembler of the infringing system because they combine as

an APNS bundle Affirmed Mobile Core software with an Azure Stack Edge Server to create "a complete turkey solution for private LTE/5G networks," thereby making the infringing system. Exhibit 17, Microsoft Azure Marketplace_APNS.pdf at 1. Further evidence that Defendants are the final assembler of the infringing network is that they sell and offer for sale APNS as a paid service for their customers. In that scenario, Defendants own and operate the servers that run APNS software to operate their customers' networks, install the software on their servers, configure the software, and connect the servers running APNS to their customers' BTSs (wireless transceivers), such as eNodeBs. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) shows that Defendants offer and sell the service of configuring and operating an Affirmed Mobile Core system as part of providing APNS.

139. Microsoft and Affirmed Networks directly infringe by operating as a joint enterprise with respect to making, using, marketing, importing, selling, and offering for sale APNS, including as a combination of the Affirmed Networks Affirmed Mobile Core software and Microsoft ASE servers. Affirmed Networks is a subsidiary of Microsoft, and Defendants cooperate to provide the services of managing and configuring the APNS solution. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) at 1-2.

140. Defendants further directly infringe by directing and controlling the infringing systems, and obtaining benefits from their control of the systems as a whole when Defendants configure and maintain the infringing systems as a paid service for their customers. Under this scenario, discussed above, Defendants provide APNS in combination with Microsoft Azure's capabilities to make a network that Microsoft manages, and thereby controls, as a service for mobile network operators and other customers. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) at 1.

141. As shown below, APNS meets all of the limitations of Claim 42 of the '988 Patent.

142. **A network communications system**: APNS is a network communication system because it provides private LTE/5G networks. Exhibit 17, Microsoft Azure Marketplace_APNS.pdf at 1. With APNS, operators can provide enterprises with a private network to operate business applications requiring low-latency and end-to-end security. *Id*.

143. **A DMA server coupled to a wireless transceiver**: APNS includes Affirmed Mobile Core software deployed on an ASE server or a virtual machine, which is a DMA server (as set forth below). Thus, the only requirement of Claim 42 with respect to the wireless transceiver is that the DMA server is ***connected*** to a wireless transceiver. APNS include an ASE server coupled by an S1/S4 interface to a wireless transceiver. Exhibit 16, Affirmed Private Network Service (APNS).pdf at 1 (APNS includes Microsoft Azure servers). This connection satisfies the limitation relating to the transceiver.

144. **The DMA server including a first interface adapted to communicate with a private Internet Protocol (IP) network**: The Affirmed Mobile Core software in APNS provides the SGW and PGW modules. On the user plane of the network, the SGW connects to the PGW through a S5/S8 interface using the GPRS Tunneling Protocol ("GTP") over a private IP network, which is the first interface, and the PGW connects to a private IP network. Furthermore, on the control plane of the GTP network, the MME connects to the SGW using the APNS private IP network, which is the S11 interface, which is also a first interface. Exhibit 25 at 7-7 (Chapter 7, p.7).

145. **A second interface adapted to communicate with a gateway communications network**: APNS' Affirmed Mobile Core includes second interfaces (the S5,

S8, and S11 interfaces) connecting SGWs and PGWs to a gateway communications network. The SGWs and PGWs are DMA gateways ("DMAG") and form a DMAG communication network. When a mobile device joins a network, the Mobility Management Entity ("MME") function in Affirmed Mobile Core sends a "Create Session Request" to an SGW in the DMAG communication network. Exhibit 44 (3GPP_TS_29.274.pdf) at 28[13] (listing GTP message types). This request message is sent from the MME to the SGW and then from the SGW to the PGW. *Id*. at 35. The Create Session Request message is transmitted from the MME to the SGW through the S11 interface and from the SGW to the PGW through the S5/S8 interface. *Id*. at 35-36.

146. **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:** APNS includes a DMA server (either an ASE server or a virtual machine running Affirmed Mobile Core) to receive a call from a mobile communications device, such as a mobile phone. The DMA server connects to a wireless transceiver for receiving a call from mobile devices, as discussed above. As shown below, (1) call information related to the call (packet data) is sent from the mobile device to E-UTRAN (through an eNodeB) to the SGW (which is a DMAG) over the S1-U interface; (2) the packet data in the call is sent to the PGW (which is a DMAG) over the S5 interface, and (3) the packet data flows to the IP network over the SGi interface. Exhibit 41 (3GPP_TS_23.401.pdf) at 52-53 (the SGW is the local mobility anchor point for inter-eNodeB handover and handles packet

[13] The Affirmed Mobile Core software in APNS is compliant with the 3GPP technical specification. Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 1, 3 (describing 3GPP compliance). Exhibit 44 (3GPP_TS_29.274.pdf) is a 3GPP specification regarding the control of the GRPSR Tunneling Protocol. Exhibit 44 (3GPP_TS_29.274.pdf) at 11-12.

routing and forwarding);[14] Exhibit 41 (3GPP_TS_23.401.pdf) at 52 (the PGW performs per-user based packet filtering); *id*. at 53 ("The PGW provides PDN connectivity to both GERAN/UTRAN only UEs and E-UTRAN capable UEs using any of E-UTRAN, GERAN or UTRAN; the P-GW provides PDN connectivity to E-UTRAN capable UEs using E-UTRAN only over the S5/S8 interface").

4.2 Architecture reference model

4.2.1 Non-roaming architecture

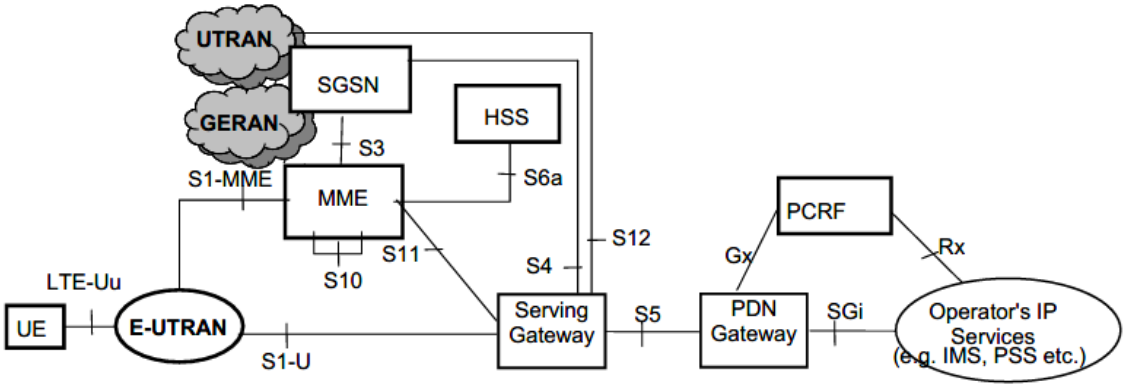
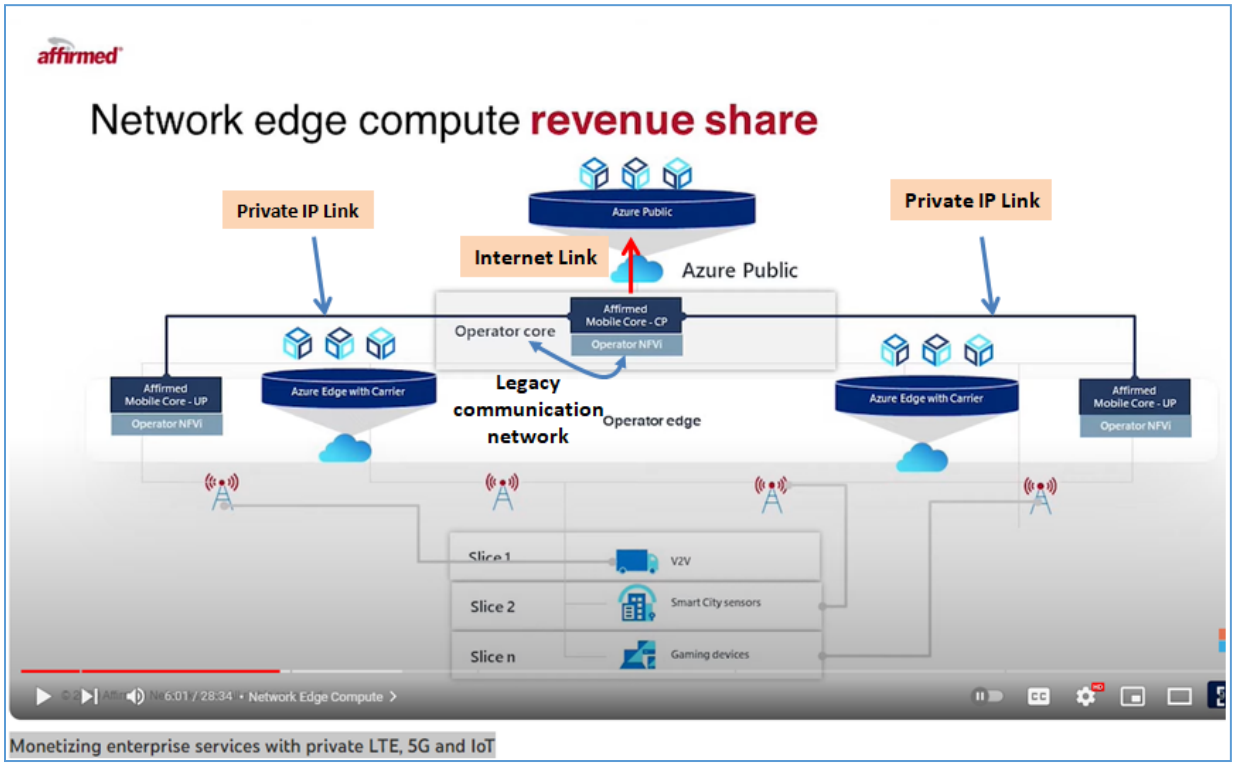


Figure 4.2.1-1: Non-roaming architecture for 3GPP accesses

Exhibit 41 (3GPP_TS_23.401.pdf) at 16 (showing the packets from the call flow from the mobile device to the SGW through the E-UTRAN, the SGW to the PGW through the S5 interface); Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 1, 3 (vEPC, which is Affirmed Mobile Core, supports 3GPP compliant open architecture including SGSN, MME, GGSN, SGW, and PGW).

[14] Exhibit 41 (3GPP_TS_23.401.pdf) describes the 3GPP standard, including its functionality for roaming and non-roaming scenarios and covers mobility between 3GPP radio access technologies, policy control, charging, and authentication. Exhibit 41 (3GPP_TS_23.401.pdf) at 10-11. Affirmed Mobile Core is 3GPP complaint, meaning that it provides the functionality described in the 3GPP standard. Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 3 (describing its 3GPP compliance).

147. **The call is placed to a destination device accessible via a legacy communications network, the legacy communications network accessible via the DMA gateway**: APNS' Affirmed Mobile Core control plane functionality provides a private IP connection link to mobile operators' legacy communications networks, such as common-carrier networks. Exhibit 26 (unofficial transcript of Defendants' video available at https://www.youtube.com/watch?v=6WKYvMhJic8 at 12:58-15:09); Exhibit 25 at 7-7 – 7-8. The structure is illustrated schematically in the following diagram:



148. When a mobile device seeks to initiate a call to a destination device that is accessible via a legacy communications network, Affirmed Mobile Core routes the call to the legacy communications network (such as a common-carrier network) through the SGW, which is a DMAG. When the destination mobile device joins the legacy communications network, the MME module in the Affirmed Mobile Core sends a "Create Session Request" to the SGW.

Exhibit 43 (3GPP_TS_29.274.pdf) at 28 (list of GTP message types). The Create Session Request message includes an IMSI identifying the destination device, User Location Information ("ULI"), serving network information, packet data network ("PDN") type, charging characteristics, the TWAG identifier, and the ePDG IP address. *Id*. at 38-50.

149. ULI identity types are shown in the table below, and include Service Area Indicator ("SAI"), Location Area Indicator ("LAI"), RAI Routing Area Indicator ("RAI"). The serving network information in ULI indicates that the destination mobile device is accessible through a legacy communications network.

Octets	Bits 8	7	6	5	4	3	2	1
1	Type = 86 (decimal)							
2 to 3	Length = n							
4	Spare				Instance			
5	Extended Macro eNode B ID	Macro eNode B ID	LAI	ECGI	TAI	RAI	SAI	CGI
a to a+6	CGI							
b to b+6	SAI							
c to c+6	RAI							
d to d+4	TAI							
e to e+6	ECGI							
f to f+4	LAI							
g to g+5	Macro eNodeB ID							
g to g+5	Extended Macro eNodeB ID							
h to (n+4)	These octet(s) is/are present only if explicitly specified							

Figure 8.21-1: User Location Information

Id. at 261.

150. Affirmed Mobile Core includes the SRVCC (Single Radio Voice Call Continuity) functionality to transfer calls between mobile networks. The SRVCC moves an active call to a mobile device from LTE to a legacy network (GSM/UMTS/PSTN) through the

Sv interface. Exhibit 27 at 47.[15] Affirmed Mobile Core uses its SGs interface to connect the MME to the MSC/VLR for accessing the legacy communications network for calling the destination mobile device and supporting circuit switched fallback to GSM or UMTS (legacy communications network). *See* Exhibit 27 at 47 (the SGs interface connecting MME to MSC/VLR).

151. Defendants' infringement of the '988 Patent has injured and continues to injure Lemko in an amount to be proven at trial, but not less than a reasonable royalty. Defendants' infringement has caused and is continuing to cause irreparable injury to Lemko, and Lemko will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by the Court.

152. Pursuant to 35 U.S.C. §§ 283, 284, and 285, Lemko is entitled to injunctive relief, damages, and attorney's fees and costs.

COUNT VI
(Indirect Infringement of the '988 Patent)

153. Lemko repeats, realleges, and incorporates by reference, as if fully set forth herein, the allegations of the preceding paragraphs.

154. Defendants' customers directly infringe the '988 Patent when they use or assemble Affirmed Mobile Core in APNS as an operating network, for example by installing Affirmed Mobile Core in APNS on ASE servers and connecting those servers to BTSs, thereby making an infringing network. Defendants have induced and contributed to their customers' direct infringement of the '988 Patent under 35 U.S.C. § 271(b) by instructing and encouraging

[15] This document (Affirmed Networks vMME Operator Guide) provides configuration procedures for the MME and the SGSN in vEPC. Exhibit 27 at 1. As discussed above, Defendants now market vEPC as Affirmed Mobile Core.

their customers' infringing use and making of APNS as a system infringing at least exemplary Claim 42.

155. Defendants know about the '988 Patent and that APNS infringes the '988 Patent, at least from their receipt of Lemko's February 14, 2022 Complaint, December 20, 2022 Preliminary Infringement Contentions, and October 19, 2023 First Amended Complaint.

156. Lemko's Complaint specifically identifies the Asserted Patents and the Accused Products, states that Defendants are infringing, and explains Defendants' infringement of the '988 Patent. Doc. 1 at ¶¶ 122-150.

157. Lemko's First Amended Complaint specifically identifies the Asserted Patents and the Accused Products, states that Defendants are infringing, and explains Defendants' infringement of the '988 Patent. Doc. 59 at ¶¶ 136-157.

158. Appx. C-1 to Lemko's Preliminary Infringement Contentions, Exhibit 29 hereto, provides a detailed disclosure of Defendants' infringement of the '988 Patent.

159. This Second Amended Complaint further places Defendants on specific notice that they are infringing and contributing to and inducing customers' infringement of the '988 Patent.

160. Defendants knowingly and actively aided and abetted their customers' direct infringement of the '988 Patent. As discussed above, APNS infringes the '988 Patent. Defendants instruct and encourage their customers on how to use each of these important features of APNS, particularly the ASE servers and the Affirmed Mobile Core functions, including managing the ASE servers, connecting mobile calls in multiple mobile coverage areas, transferring mobile calls directed to different network domains, and configuring the SIM or partner applications in service portals. Defendants do so through trainings, reference

materials, user manuals, user guides, promotional materials, and by providing customer support, which are all intended to enable and encourage customers' purchase, installation, and use of APNS, including how to install APNS on ASE servers, configure APNS in Azure Network Function Manager, and operate APNS in the ecosystem provided in Microsoft Azure marketplace.

161. Defendants operate an online site called "Azure Community Support," with discussions and articles covering the use of Azure Stack Edge, which when combined with Azure cloud and Affirmed Mobile Core, makes up APNS. Exhibit 42 (https://azure.microsoft.com/en-us/support/community/). Azure Community Support covers in-depth installing and configuring ASE servers, and includes tutorials and manuals for installing and configuring ASE servers. Defendants also publish a variety of product documentation that describe APNS' functionality. *See, e.g.*, Exhibit 31, (https://www.affirmednetworks.com/asset-type/white-papers/) (listing Affirmed Networks white papers). Defendants also provide product blog posts that cover Affirmed Mobile Core's infringing features and instruct customers on how to configure and use Affirmed Mobile Core (which is a key component of APNS). *See, e.g.*, Exhibit 32 (https://www.affirmednetworks.com/blog/) (listing Affirmed Networks blog posts, including on vEPC, which is now Affirmed Mobile Core).

162. In addition, Defendants support customers' use and configuration of APNS through a dedicated support center. Exhibit 33 (https://www.affirmednetworks.com/support/) ("Affirmed Networks' 24/7/365 global support team ensures rapid response times to assist communication service providers (CSPs) no matter where they are in their virtualization

journey, from initial network design to system integration and post-production support, for 2G, 3G, 4G, and 5G networks.").

163. Defendants are also liable for contributory infringement of the '988 Patent pursuant to 35 U.S.C. § 271(c) by knowing or being willfully blind to the fact that they are contributing to their customers' infringement of at least exemplary Claim 42 by offering to sell and selling APNS in the United States. The APNS software and ASE servers that Defendants provide is, at a minimum, a material component of the system that infringes Claim 42 of the '988 Patent.

164. The APNS software, which provides Affirmed Mobile Core-UP (DMA) and Affirmed Mobile Core-CP (DMAG) interface functionality, is not a staple article or commodity of commerce suitable for substantial noninfringing use. The function of APNS is to provide the accused mobile networks, which infringe when they operate as described above for Count V, and they have no purpose other than to be used to provide the accused mobile networks. Defendants therefore know or are willfully blind to the fact that they are contributing to their customers' infringement of the '988 Patent, including Claim 42.

165. Defendants' indirect infringement of the '988 Patent has injured and continues to injure Lemko in an amount to be proven at trial, but not less than a reasonable royalty. Lemko will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by the Court.

166. Pursuant to 35 U.S.C. §§ 283, 284, and 285, Lemko is entitled to injunctive relief, damages, and attorney's fees and costs.

COUNT VII
(Direct Infringement of the '409 Patent)

167. Lemko repeats, realleges, and incorporates by reference, as if fully set forth herein, the allegations of the preceding paragraphs, as set forth above.

168. In violation of 35 U.S.C. § 271(a), Defendants directly infringe at least exemplary Claim 1 of the '409 Patent by making, using, importing, selling, and offering for sale in the United States at least Affirmed Private Network Service (APNS) and vProbe without the permission, consent, authorization, or license of Lemko.

169. Defendants' infringement is based upon literal infringement or, at the very least, infringement under the doctrine of equivalents.

170. Defendants directly infringe by acting as the final assembler of the infringing DMA gateway. Defendants are the final assembler of the infringing system because they provide the combination of APNS and vProbe, including by providing, installing, and configuring the Affirmed Mobile Core (which is part of APNS) and vProbe software on servers and connecting those servers to base transceiver stations, such as eNodeBs (as discussed below), thereby making the infringing system. Further evidence that Defendants are the final assembler of the infringing network is that they sell and offer for sale APNS and vProbe as a paid service for their customers. In that scenario, Defendants own and operate the servers that run APNS and vProbe software to operate their customers' networks, install the software on their servers, configure the software, and connect the servers running APNS and vProbe to their customers' BTSs (wireless transceivers), such as eNodeBs. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) shows that Defendants offer and sell the service of configuring and operating an Affirmed Mobile Core system as part of providing APNS.

171. Microsoft and Affirmed Networks directly infringe by operating as a joint enterprise with respect to making, using, marketing, importing, selling, and offering for sale APNS, including as a combination of the Affirmed Networks Affirmed Mobile Core software and Microsoft ASE servers. Affirmed Networks is a subsidiary of Microsoft, and Defendants cooperate to provide the services of managing and configuring the APNS solution. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) at 1-2.

172. Defendants further directly infringe by directing and controlling the infringing systems, and obtaining benefits from their control of the systems as a whole when Defendants configure and maintain the infringing systems as a paid service for their customers. Under this scenario, discussed above, Defendants provide APNS to make a network that Microsoft manages, and thereby controls, as a service for mobile network operators and other customers. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) at 1.

173. **A DMAG**: As shown below, APNS meets all of the limitations of the DMAG of Claim 1 of the '409 Patent.

174. **A data storage device**: APNS includes either an ASE server or a virtual machine node, which are data storage devices. Exhibit 22 (Part 1) at 14 (explaining Azure storage blobs and Azure files data access). Defendants sell ASE servers, which host APNS. In addition, when Defendants sell APNS as cloud-hosted service, it operates on Defendants' servers that are data storage devices.

175. **A legacy network interface adapted to communicate with a legacy communication network**: The Affirmed Mobile Core in APNS includes Lu, Gb, SGs, and Sv interfaces, which are interfaces adapted to communicate with legacy communication networks. The Lu interface in the Affirmed Mobile Core connects to UMTS/3G, which is a legacy

communication network, using "the radio access equipment" (e.g., Radio Network Controller for the Base Transceiver Station) that "runs over IP transport mechanism." Exhibit 27 at 78.[16] The Gb interface in the Affirmed Mobile Core communicates with a legacy communication network, General Packet Radio Service ("GPRS")/2G equipment (Packet Control Unit for the Base Transceiver Station) that "supports IP (Internet Protocol) or FR (Frame Relay) transport." *Id*. at 81. The SGs interface in the Affirmed Mobile Core connects the MME to the MSC/VLR to provide "Circuit Switched Fallback to GSM or UMTS," which is a legacy network. *Id*. at 47. The Sv interface in the Affirmed Mobile Core supports SRVCC to move an active IP Multimedia Subsystem ("IMS") voice call in a packet switching domain, such as the LTE network to legacy circuit networks. *Id*. at 58.

176. **A home DMA register including a list of a first group of DMA nodes**: the HSS/HLR is a home DMA register and includes a list of MMEs/SGSNs, which are a first group of DMA nodes. For a given subscriber, the HSS is the master database which contains the subscription-related information to support the network entities actually handling calls. Exhibit 23 at 20.[17] The HSS enables identifying the mobile subscribers either at home or roaming through the authentication, authorization, naming/addressing resolution, and location dependency procedures. *Id*.

[16] This document (Affirmed Networks vMME Operator Guide) provides configuration procedures for the MME and the SGSN in vEPC. Exhibit 27 at 1. As discussed above, Defendants now market vEPC as Affirmed Mobile Core.

[17] The Affirmed Mobile Core software is compliant with the 3GPP technical specification. Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 3 (describing its 3GPP compliance); Exhibit 23 at 10. It covers architectures of the 3GPP system including UTRAN and GERAN radio access technologies, IP Multimedia Subsystem ("IMS"), and interworking between IMS and Circuit Switched systems. Exhibit 23 at 10.

177. **The DMAG is designated to route calls directed to one or more mobile stations served by the first group of DMA nodes**: Affirmed Mobile Core routes calls directed to the mobile devices through SGWs/PGWs (DMAGs) served by the first group of the DMA nodes, including the MME/SGSN, to route the call to mobile device through the SGW and the PGW. The SGW "transmits and receives user data packets from mobile base stations (eNodeB) to/from the network." Exhibit 25 at 7-2.[18] The SGW acts as a mobility anchor point between the LTE and 3GPP technologies and triggers paging functionality. *Id*. The SGW transmits and receives data packets "from the *Enhanced Universal Terrestrial Radio Access Network* (EUTRAN) to/from the PDN gateway and acts as a demarcation point between the RAN network and core network." *Id*. at 7-7.

178. **A visitor DMA register including a list of a second group of DMA nodes**: The Affirmed Mobile Core in APNS includes the MSC/VLR, which is a visitor DMA register because it stores locations and subscription information relating to MMEs/SGSNs, which is a list of roaming DMA nodes connecting to SGWs/PGWs (DMAGs). The mobile device is registered with the roaming DMA nodes (SGSN/MME), which connect to SGWs/PGWs (DMAGs) in the coverage area defined in the MSC/VLR. Based on the peer's status and the

[18] Exhibit 25 is a manual for Mobile Content Cloud, which provides virtualized EPC (vEPC) functionalities. Exhibit 25 at 1-2 ("The Affirmed Networks Mobile Content Cloud is a virtualized EPC (vEPC) . . . solution"). As discussed above, Defendants previously marketed their mobile core software as vEPC, and now market it as Affirmed Mobile Core and Affirmed Mobile Content Cloud. Exhibit 13 (Affirmed Intel vEPC Performance Report.pdf) at 1, 2 ("Affirmed Mobile Content Cloud (MCC) . . . offers . . . vEPC functionality" and describing tests of Affirmed Mobile Core as testing of Affirmed vEPC). As shown in the manual, the Affirmed Mobile Core software (referred to as Mobile Content Cloud) is 3GPP compliant. Exhibit 25 at 1-16. This includes providing SGSN, MME, GGSN, SGW and PGW functionality to support network services in 2G, 3G, 4G, LTE, and VoLTE mobile networks. *Id.*; Exhibit 46 (3GPP.pdf) at 1 (3GPP specifications cover cellular telecommunications technologies).

subscriber's local home/visiting status, a subscriber of a mobile device is classified as "Home, Roam-in, or Roam-out." Exhibit 25 at 7-27. When a mobile device enters a new location area, it starts a registration procedure. Exhibit 47 (3GPP_TS_23.002.pdf) at 23.[19] The MSC notices this registration and transfers the identity of the location area where the mobile device is situated to a VLR. *Id*. If this mobile device is not registered in the VLR, the VLR and HLR exchange information to allow the proper handling of circuit switch calls. *Id*.

179. **Each DMA node of the second group of DMA nodes is roaming with respect to the DMAG and the DMAG is adapted to temporarily route calls directed to one or more mobile stations served by the second group of DMA nodes:** Each MME/SGSN (DMA node) of the second group of the DMA nodes is roaming with respect to the SGW/PGW (DMAG) within the MSC/VLR area. Once the call is made to the SGW/PGW (the DMAG), the SGW/PGW will temporarily route the calls depending on the routing path based on the location of the mobile devices. An eNodeB (base station) in the MSC/VLR area may connect to several MMEs (the DMA nodes). Exhibit 41 (3GPP_TS_23.401.pdf) at 35.[20] From a RAN perspective, a pool area that comprise one or more tracking areas are served by a group of MMEs. *Id*. If the mobile device is roaming in the coverage area of the second group

[19] This specification is produced by 3GPP. Exhibit 47 (3GPP_TS_29.274.pdf) at 10. It presents the architecture for UTRAN and GERAN radio access technologies. *Id*. It also presents the architecture for the IP Multimedia Subsystem ("IMS") and interworking and session continuity between the IMS and circuit switched systems.

[20] Exhibit 41 (3GPP_TS_23.401.pdf) describes the 3GPP standard, including its functionality for roaming and non-roaming scenarios and covers mobility between 3GPP radio access technologies, policy control, charging, and authentication. Exhibit 41 (3GPP_TS_23.401.pdf) at 10-11. Affirmed Mobile Core is 3GPP complaint, meaning that it provides the functionality described in the 3GPP standard. Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 3 (describing its 3GPP compliance).

of the DMA nodes, the calls will be routed to mobile devices based on the information from MSC/VLR, via the connected interfaces.

Figure 1-3 MCC Solution - Supported Interfaces

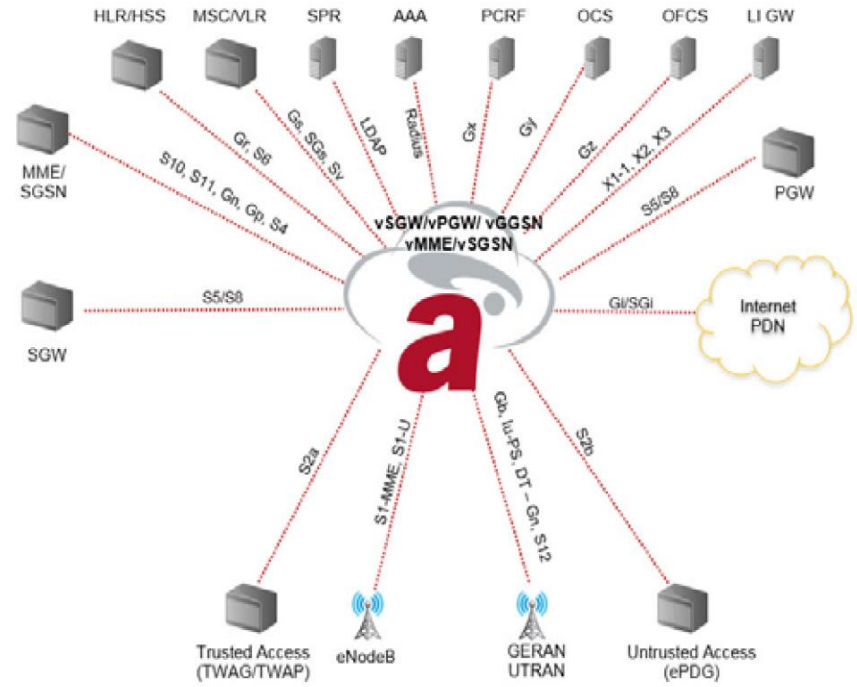


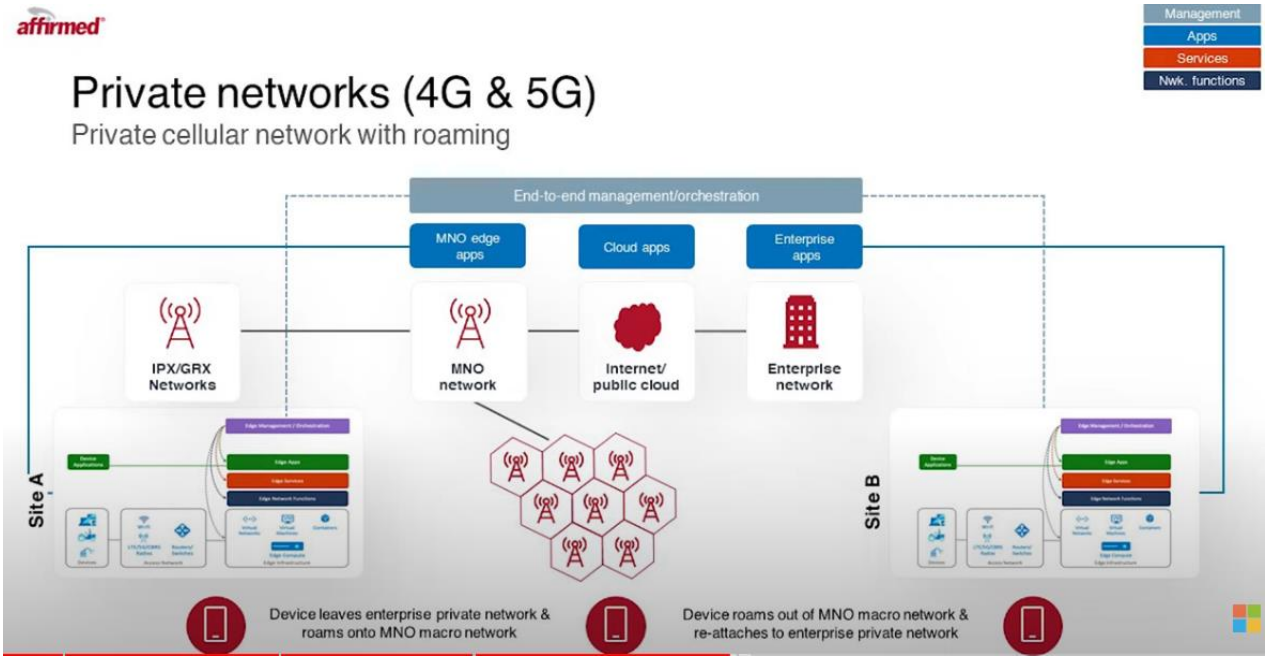
Exhibit 25 at 1-4 (showing the Gr interface between the MSC/VLR and the SGSN, and the SGs interface between the MSC/VLR and the MME).

180. The HSS may register the MMEs/SGSNs (the second group of DMA nodes) when they are roaming with respect to the SGW/PGW (DMAG) to allow temporary routing of calls to mobile devices served by the second group of DMA nodes. Based on "the peer's status and the subscriber's local home/visiting status," a subscriber is classified as "Home, Roam-in, or Roam-out." Exhibit 25 at 7-27. A peer can be classified as "local (same administrative domain) or remote (different administrative domain)" based on GTP classification. *Id*. at 7-28.

181. The SGWs/PGWs (DMAGs) can route calls to mobile devices in GSM or UMTS via the SGs to the VLR based on service-area, location-area, PLMN, LAC, IMSI, and the corresponding VLR and/or VLR pool. Exhibit 27 at 47. DMAGs can route calls through

"Single Radio Voice Call Continuity procedure between the MME and VLR." *Id*. at 49. When mobile devices are roaming (visitors in the VLR) with respect to the SGWs/PGWs (DMAGs), the Sv interface temporarily routes calls using VoLTE to one or more mobile devices served by the second group of the DMA nodes.

182. SGWs/PGWs (DMAGs) in one private network site (Site A) may route the calls to DMA nodes in a new private network site (Site B), the second group of DMA nodes, when a mobile device is roaming out of the private network site and entering into the new private network site (Site B), as shown below.



Private Networks.mp4, https://www.youtube.com/watch?v=6WKYvMhJic8, at 16:22.

183. **A master agent adapted to receive performance data from each DMA node of the first group of DMA nodes and each DMA node of the second group of DMA nodes:** Affirmed Networks' vProbe includes a vData Flow, which is a master agent adapted to receive performance data from each MME (DMA node) of the first group of DMA nodes and each MME (DMA node) of the second group of DMA nodes. vProbe is "co-located with the

Affirmed's Mobile Content Cloud vEPC and WiFi Solutions rather than delivered as a separate network appliance" to record data for each DMA node. Exhibit 36 at 1.[21]

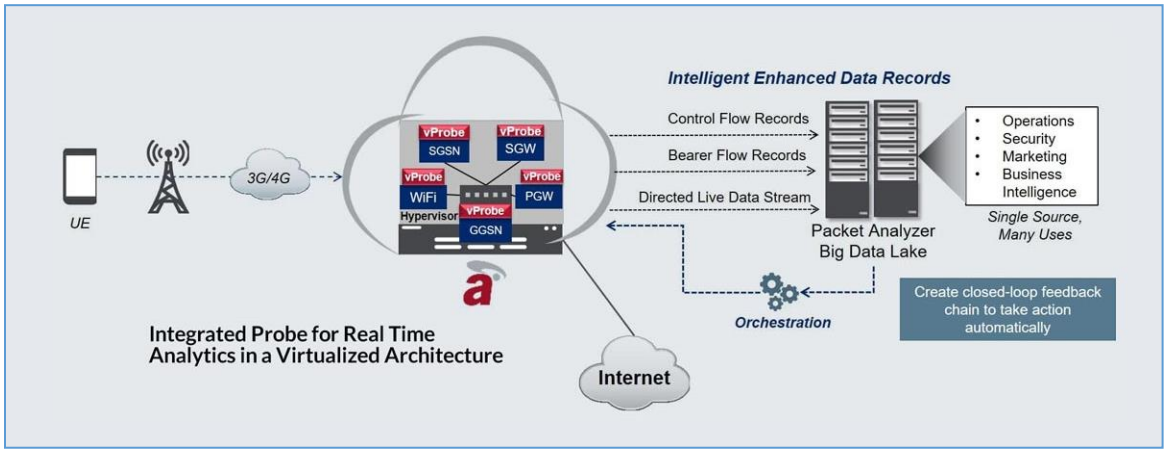
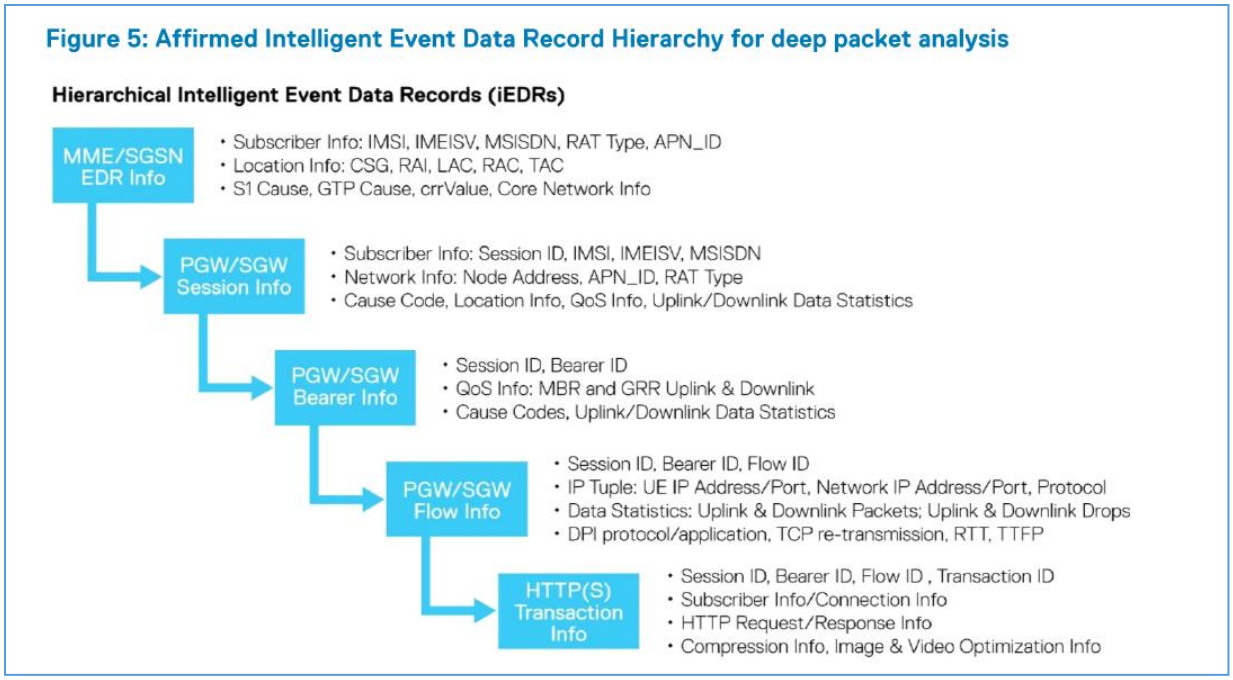


Exhibit 45 (Network Probe_ Virtual Probe (vProbe).pdf) at 2 (showing vProbe is co-locating with Affirmed Mobile Core).

184. **An operations module**: vProbe provides vControl Flow, which is an operations module, to collect all control plane traffic and report "session control, subscriber events and subscriber data selectively through user-defined filtering." Exhibit 36 at 2.

185. **Store the performance data in the data storage device**: vProbe's vControl Flow stores Intelligent Event Data Records ("iEDRs"), which are "[c]omplete granular data capture of session, bearer, flow, and transaction details in the data and control plane" (performance data) in either an ASE server or a virtual machine node, which are data storage devices. Exhibit 37 at 8. The iEDR hierarchy is shown below:

[21] Mobile Content Cloud is part of vEPC. Exhibit 25 at 1-2 ("The Affirmed Networks Mobile Content Cloud is a virtualized EPC (vEPC) . . . solution"). The software is 3GPP compliant. *Id.* at 1-16. This includes providing SGSN, MME, GGSN, SGW and PGW functionality to support network services in 2G, 3G, 4G, LTE, and VoLTE mobile networks. *Id.*; Exhibit 46 (3GPP.pdf) at 4.



Id. (showing how the iEDRs stored in hierarchy for deep packet probe).

186. **Send the performance data from each DMA node of the second group of DMA nodes to one or more additional DMAGs via a private IP network:** The performance data is sent to one or more additional SGWs/PGWs (DMAGs) via APNS, which is a private IP network. The SGWs/PGWs route communications directed to the mobile devices served by MMEs/SGSNs (the second group of the DMA nodes). The DMAG receives and records performance data and can provide it to the additional DMAGs via the APNS network (private IP network).

187. **At least a portion of the calls routed by the DMAG are communicated via the legacy network interface**: The SGWs/PGWs (DMAGs) route a portion of the calls to the mobile devices through the Lu, SF, and Sv interfaces (legacy network interfaces). The Lu interface communicates with "the radio access equipment" for UMTS/3G (a legacy network) to route calls. Exhibit 27 at 78. The SGs interface routes calls through the MSC/VLR for "Circuit Switched Fallback to GSM or UMTS" (another legacy network). *Id.* at 47. The Sv

interface connects the SGSN and the MSC/VLR to support Single Radio Voice Call Continuity ("SRVCC"), so "a voice call started on the EPC network using VoLTE can be handed over to the legacy circuit domain seamlessly," which is another legacy network. *Id*. at 49.

188. Defendants' infringement of the '409 Patent has injured and continues to injure Lemko in an amount to be proven at trial, but not less than a reasonable royalty. Defendants' infringement has caused and is continuing to cause irreparable injury to Lemko, and Lemko will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by this Court.

189. Pursuant to 35 U.S.C. §§ 283, 284, and 285, Lemko is entitled to injunctive relief, damages, and attorney's fees and costs.

COUNT VIII
(Indirect Infringement of the '409 Patent)

190. Lemko repeats, realleges, and incorporates by reference, as if fully set forth herein, the allegations of the preceding paragraphs.

191. Defendants' customers directly infringe the '409 Patent when they use or assemble APNS and vProbe as an operating network, for example by installing Affirmed Mobile Core and vProbe software on ASE servers and connecting those servers to BTSs, thereby making an infringing DMAG. Defendants have induced and contributed to their customers' direct infringement of the '409 Patent under 35 U.S.C. § 271(b) by instructing and encouraging their customers' infringing use and making of APNS and vProbe as a system infringing at least exemplary Claim 1.

192. Defendants know about the '409 Patent and that APNS and vProbe infringe the '409 Patent, at least from their receipt of Lemko's February 14, 2022 Complaint, December 20, 2022 Preliminary Infringement Contentions, and October 19, 2023 First Amended Complaint.

193. Lemko's Complaint specifically identifies the Asserted Patents and the Accused Products, states that Defendants are infringing, and explains Defendants' infringement of the '409 Patent. Doc. 1 at ¶¶ 151-182.

194. Lemko's First Amended Complaint specifically identifies the Asserted Patents and the Accused Products, states that Defendants are infringing, and explains Defendants' infringement of the '409 Patent at paragraphs. Doc. 59 at ¶¶ 158-188.

195. Appx. D-1 to Lemko's Preliminary Infringement Contentions, Exhibit 30 hereto, provides a detailed disclosure of Defendants' infringement of the '409 Patent.

196. This Second Amended Complaint further places Defendants on specific notice that they are infringing and contributing to and inducing customers' infringement of the '409 Patent.

197. Defendants knowingly and actively aided and abetted their customers' direct infringement of the '409 Patent. As discussed above, APNS and vProbe infringe the '409 Patent through their provision of DMAG, call routing, and performance data monitoring functionality. Defendants instruct and encourage their customers on how to use each of these important features of Affirmed Mobile Core, including through trainings, reference materials, user manuals, user guides, promotional materials, and by providing customer support, which are all intended to enable and encourage customers' purchase, installation, and use of APNS and vProbe, including its DMAG, call routing, and performance data monitoring functionality.

198. For example, Defendants also publish a variety of product documents that describe functionality of the Affirmed Mobile Core software in APNS. *See, e.g.*, Exhibit 31, (https://www.affirmednetworks.com/asset-type/white-papers/) (listing Affirmed Networks white papers). Defendants also provide product blog posts that cover Affirmed Mobile Core's

infringing features and instruct customers on how to configure and use Affirmed Mobile Core. *See, e.g.,* Exhibit 32 (https://www.affirmednetworks.com/blog/) (listing Affirmed Networks blog posts, including on vEPC, which is now Affirmed Mobile Core).

199. In addition, Defendants support customers' use and configuration of APNS Mobile Core through a dedicated support center. Exhibit 33 (https://www.affirmednetworks.com/support/) ("Affirmed Networks' 24/7/365 global support team ensures rapid response times to assist communication service providers (CSPs) no matter where they are in their virtualization journey, from initial network design to system integration and post-production support, for 2G, 3G, 4G, and 5G networks.").

200. In addition, Defendants operate an online site called "Azure Community Support," with discussions and articles covering the use of ASE servers. Exhibit 42 (https://azure.microsoft.com/en-us/support/community/). Azure Community Support covers in-depth instructions for installing and configuring ASE servers.

201. Defendants are also liable for contributory infringement of the '409 Patent pursuant to 35 U.S.C. § 271(c) by knowing or being willfully blind to the fact that they are contributing to their customers' infringement of at least exemplary Claim 1 by offering to sell and selling Affirmed Mobile Core and vProbe in the United States. The SGW/PGW (DMAG), call routing, and performance monitoring software, which Defendants provide, is, at a minimum, a material component of the systems that infringe Claim 1 of the '409 Patent.

202. Affirmed Mobile Core and vProbe are not staple articles or commodities of commerce suitable for substantial noninfringing use. The function of Affirmed Mobile Core is to provide the accused mobile networks, which infringe when they are operate as described above for Count VII, and they have no purpose other than to be use to provide the accused

mobile networks. Defendants therefore know or are willfully blind to the fact that they are contributing to their customers' infringement of the '409 Patent, including Claim 1.

203. As discussed above, Lemko put Defendants on notice of their infringement of the '409 Patent. Defendants therefore know or are willfully blind to the fact that they are contributing to the infringement of one or more claims of the '409 Patent, including Claim 1.

204. Defendants' indirect infringement of the '409 Patent has injured and continues to injure Lemko in an amount to be proven at trial, but not less than a reasonable royalty. Lemko will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by the Court.

205. Pursuant to 35 U.S.C. §§ 283, 284, and 285, Lemko is entitled to injunctive relief, damages, and attorney's fees and costs.

COUNT IX
(Direct Infringement of the '111 Patent)

206. Lemko repeats, realleges, and incorporates by reference, as if fully set forth herein, the allegations of the preceding paragraphs, as set forth above.

207. In violation of 35 U.S.C. § 271(a), Defendants directly infringe at least exemplary Claim 15 of the '111 Patent by making, using, importing, selling, and offering for sale in the United States at least APNS without the permission, consent, authorization, or license of Lemko.

208. Defendants' infringement is based upon literal infringement or, at the very least, infringement under the doctrine of equivalents.

209. Defendants directly infringe by acting as the final assembler of the infringing system that performs the method of Claim 15. Defendants are the final assembler of the infringing system because they combine as an APNS bundle Affirmed Mobile Core software

with an Azure Stack Edge Server to create "a complete turkey solution for private LTE/5G networks," thereby making the infringing system. Exhibit 17, Microsoft Azure Marketplace_APNS.pdf at 1. Further evidence that Defendants are the final assembler of the infringing network is that they sell and offer for sale APNS as a paid service for their customers. In that scenario, Defendants own and operate the servers that run APNS software to operate their customers' networks, install the software on their servers, configure the software, and connect the servers running APNS to their customers' BTSs (wireless transceivers), such as eNodeBs. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) shows that Defendants offer and sell the service of configuring and operating an Affirmed Mobile Core system as part of providing APNS.

210. Microsoft and Affirmed Networks directly infringe by operating as a joint enterprise with respect to making, using, marketing, importing, selling, and offering for sale APNS, including as a combination of the Affirmed Networks Affirmed Mobile Core software and Microsoft ASE servers. Affirmed Networks is a subsidiary of Microsoft, and Defendants cooperate to provide the services of managing and configuring the APNS solution. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) at 1-2.

211. Defendants further directly infringe by directing and controlling the systems that perform the claim method, and obtaining benefits from their control of the systems as a whole when Defendants configure and maintain the infringing systems as a paid service for their customers. Under this scenario, discussed above, Defendants provide APNS in combination with Microsoft Azure's capabilities to make a network that Microsoft manages, and thereby controls, as a service for mobile network operators and other customers. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) at 1.

212. As shown below, APNS performs each step of Claim 15 of the '111 Patent.

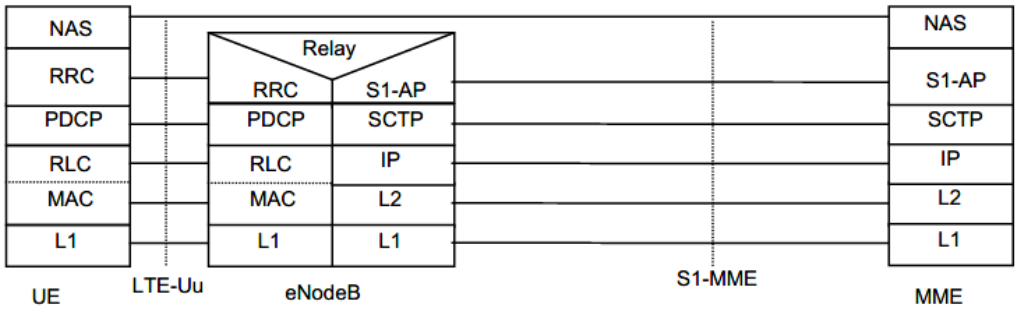
213. **A method to receive at a first DMA system, a call from a first mobile subscriber to a second mobile subscriber**: APNS includes the SGW, PGW, and MME modules in Affirmed Mobile Core, which are a first DMA system. The SGW "transmits and receives user data packets from mobile base stations (eNodeB) to/from the network." Exhibit 25 at 7-2. The SGW acts as a mobility anchor point between LTE and 3GPP technologies and triggers paging functionality. *Id*. The SGW transmits and receives data packets "from the *Enhanced Universal Terrestrial Radio Access Network* (EUTRAN) to/from the PDN gateway and acts as a demarcation point between the RAN network and core network." *Id*. at 7-7.

214. The first SGW/PGW/MME (DMA system) receives a VoLTE call from a mobile device (the first mobile subscriber) in the wireless coverage area of the first DMA system. The call is directed to a target mobile device (a second mobile subscriber) in the wireless coverage area of a second node running Affirmed Mobile Core with an SGW, PGW, and MME (a second DMA system). The first mobile device transmits the VoLTE call data (user plane traffic) to the base station (eNodeB) and to the SGW in the first DMA system. The mobile device transmits control plane data to the eNodeB and to MME in Affirmed Mobile Core.

215. As shown below, the call data are sent from the first mobile device to E-UTRAN (i.e., the eNodeB) to the SGW at the first Affirmed Mobile Core node (the first DMA system) over the S1-U interface; the packet data in the call is then sent to the PGW over the S5 interface and to the IP network over the SGi interface. Exhibit 41 (3GPP_TS_23.401.pdf) at 52-53 (the SGW is the local Mobility Anchor point for inter-eNodeB handover and handles

Packet routing and forwarding);[22] Exhibit 41 (3GPP_TS_23.401.pdf) at 52 (PGW performs per-user based packet filtering); *id*. at 53 ("The PGW provides PDN connectivity to both GERAN/UTRAN only UEs and E-UTRAN capable UEs using any of E-UTRAN, GERAN or UTRAN; the P-GW provides PDN connectivity to E-UTRAN capable UEs using E-UTRAN only over the S5/S8 interface"). The received packet data travels to the PGW from the IP network before being sent to the SGW and the E-UTRAN to reach the second mobile device. The MME manages the session and mobility in the control plane. Exhibit 41 (3GPP_TS_23.401.pdf) at 51-52.

5.1.1.3 UE - MME



Legend:
- **NAS:** The NAS protocol supports mobility management functionality and user plane bearer activation, modification and deactivation. It is also responsible of ciphering and integrity protection of NAS signalling.
- **LTE-Uu:** The radio protocol of E-UTRAN between the UE and the eNodeB is specified in TS 36.300 [5].

Figure 5.1.1.3-1: Control Plane UE - MME

Exhibit 41 (3GPP_TS_23.401.pdf) at 67 (showing the packet data flow between mobile device and MME).

[22] Exhibit 41 (3GPP_TS_23.401.pdf) describes the 3GPP standard, including its functionality for roaming and non-roaming scenarios and covers mobility between 3GPP radio access technologies, policy control, charging, and authentication. Exhibit 41 (3GPP_TS_23.401.pdf) at 10-11. Affirmed Mobile Core is 3GPP complaint, meaning that it provides the functionality described in the 3GPP standard. Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 3 (describing its 3GPP compliance).

216. **Determining whether the second mobile subscriber is registered with one of the first DMA system and a second DMA system based on information stored at an authentication, authorization, and accounting ("AAA") module**: Affirmed Mobile Core software includes an AAA module. The AAA module is used to determine if the second mobile subscriber is reachable by the first or second Affirmed Mobile Core instance (the first or second DMA system). The Affirmed Mobile Core instances, including the first and second DMA systems, each include an AAA module, which is the part of the HSS that stores the service area identifier and the tracking area identifier. Exhibit 27 at 61-62.[23] The HSS is responsible for identifying if the user is registered with the first or the second Affirmed Mobile Core instance (first or second DMA system) based on user identification, user location information, and user profile information. Exhibit 23 at 20-21.[24]

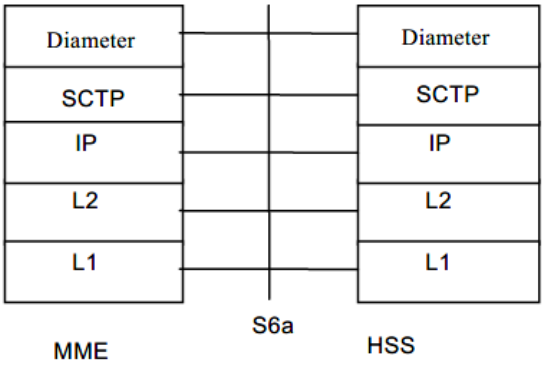
217. **A first HLR that stores information associated with one or more mobile subscribers that are registered with the first DMA system**: APNS' Affirmed Mobile Core includes a HLR module at each node (including a first HLR at the first node, which is the first DMA system) to store the mobile subscriber information registered with each node. The HSS supports the call control and session management entities of different domains and subsystems including the first DMA system and the second DMA system. Exhibit 23 at 21. The HLR is part of the HSS, which holds information related to the mobile subscribers including the MME

[23] This document (Affirmed Networks vMME Operator Guide) provides configuration procedures for the MME and the SGSN in vEPC. Exhibit 27 at 1. As discussed above, Defendants now market vEPC as Affirmed Mobile Core.

[24] The Affirmed Mobile Core software is compliant with the 3GPP technical specification. Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 3 (describing its 3GPP compliance); Exhibit 23 at 10. It covers architectures of the 3GPP system including UTRAN and GERAN radio access technologies, IP Multimedia Subsystem ("IMS"), and interworking between IMS and Circuit Switched systems. Exhibit 23 at 10.

of the first DMA system or the second DMA system that each subscriber is registered with. The MME in each system connects to the HSS to perform authentication and authorization of mobile users connected to their respective DMA systems.

5.1.1.9 MME - HSS



Legend:

- **Diameter:** This protocol supports transferring of subscription and authentication data for authenticating/authorizing user access to the evolved system between MME and HSS (S6a). Diameter is defined in RFC 3588 [31].
- **Stream Control Transmission Protocol (SCTP):** This protocol transfers signalling messages. SCTP is defined in RFC 4960 [35].

Figure 5.1.1.9-1: Control Plane for S6a interface

Exhibit 41 (3GPP_TS_23.401.pdf) at 70 (showing protocol (diameter) that supports authentication and authorization user access between the HSS and the MME over the S6 interface); *see also* Exhibit 25 at B-7 (the HLR part of HSS "stores and updates the database containing all subscription information" from the mobile subscribers); Exhibit 27 at 61-62 (the HSS stores information indicating if the subscriber is roaming or at home).

218. The first and second Affirmed Mobile Core nodes (DMA systems) both include an MME and an HSS. Exhibit 23 at 18. When a mobile device initially attaches to the network, mobile equipment identity information is obtained from the mobile device. The MME operator may check the mobile equipment identity with an equipment identify register. Exhibit 41 (3GPP_TS_23.401.pdf) at 80. The MME passes the ME Identity (IMEISV) to the HSS and the PGW.

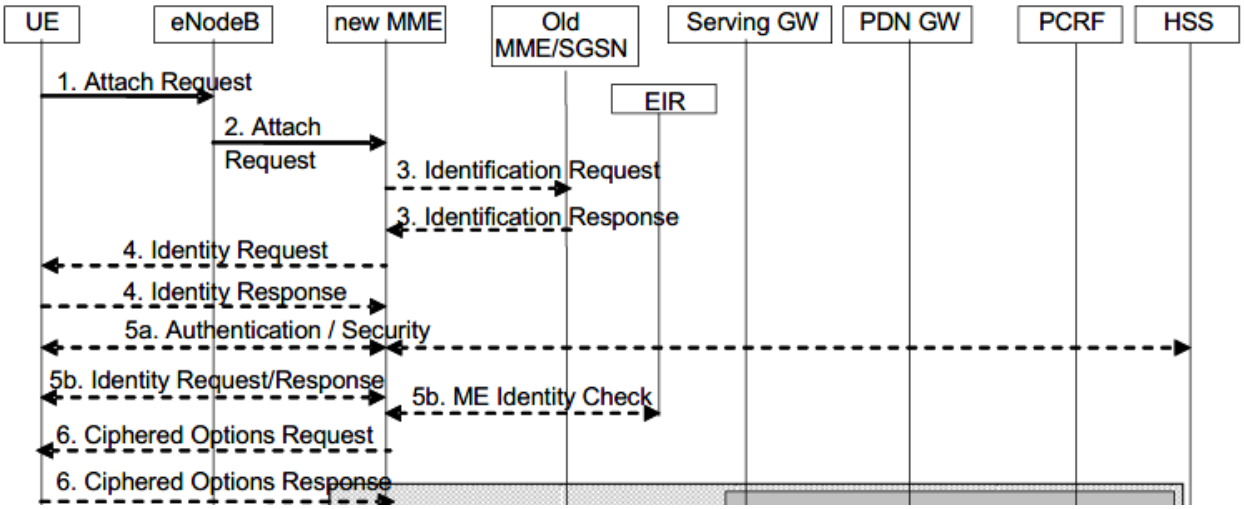


Exhibit 41 (3GPP_TS_23.401.pdf) at 82 (step 5a of attach procedure requires the authentication of mobile device by MME); Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 1, 3 (vEPC, which is Affirmed Mobile Core, supports 3GPP compliant open architecture including SGSN, MME, GGSN, SGW, and PGW).

219. **A first CLR storing information associated with a second HLR of the second DMA system**: The AAA module at each Affirmed Mobile Core instance includes an HLR that stores information associated with mobile subscribers registered at the first DMA system, which is the Affirmed Mobile Core network function node including the SGW, the PGW, or the MME. The AAA module also includes a first CLR that stores information associated with the second HLR of the second DMA system, which is another SGW, PGW, or MME. Packets sent from a source mobile device to a destination mobile device are IP packets which contain the IP address of the destination mobile device in the IP packet header. This destination IP address is information associated with a destination mobile device's mobile subscriber registered with the Affirmed Mobile Core node (the second DMA system). These packets are transmitted to the PGW in the first DMA system, which transmits the packets to the external IP network over the SGi interface. The PGW performs deep packet inspection of

these packets to access the destination IP address, which is stored in the buffers that hold the destination IP address (a first CLR to store information associated with the destination mobile device).

220. **The second HLR stores information associated with one or more mobile subscribers that are registered with the second DMA system and the second DMA system includes a second CLR**: Packets sent from a source device to a destination device are IP packets which contain the IP address of the destination mobile device in the IP packet header. This destination IP address is information associated with a destination mobile device's mobile subscriber registered with the Affirmed Mobile Core node in another DMA system. The PGW of the second Affirmed Mobile Core node (second DMA system) performs deep packet inspection of these packets to access the destination IP address, which is stored in the buffers that hold the destination IP address (a second CLR to store information associated with the destination mobile device).

5.1.2.1 UE - P-GW user plane with E-UTRAN

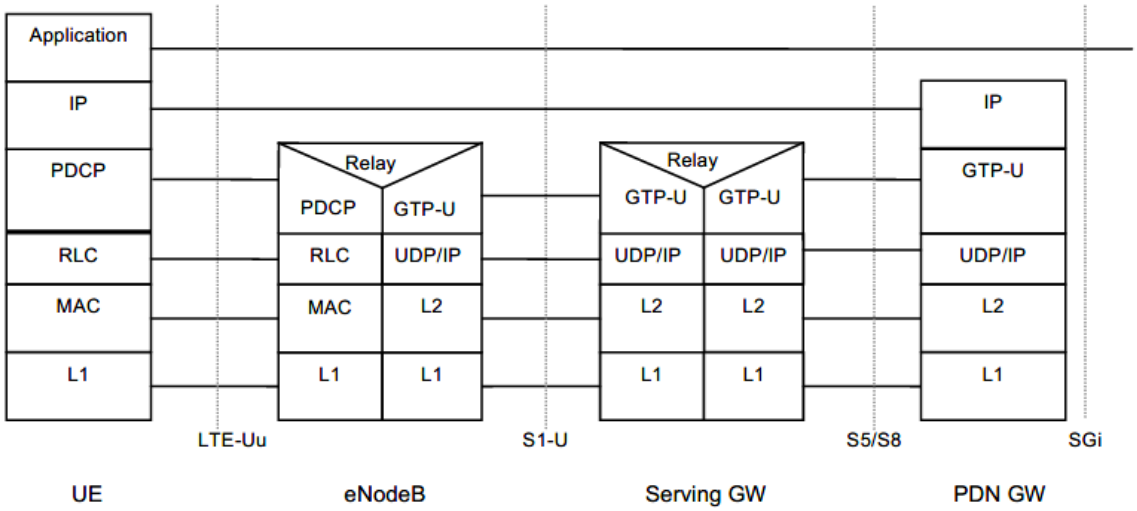
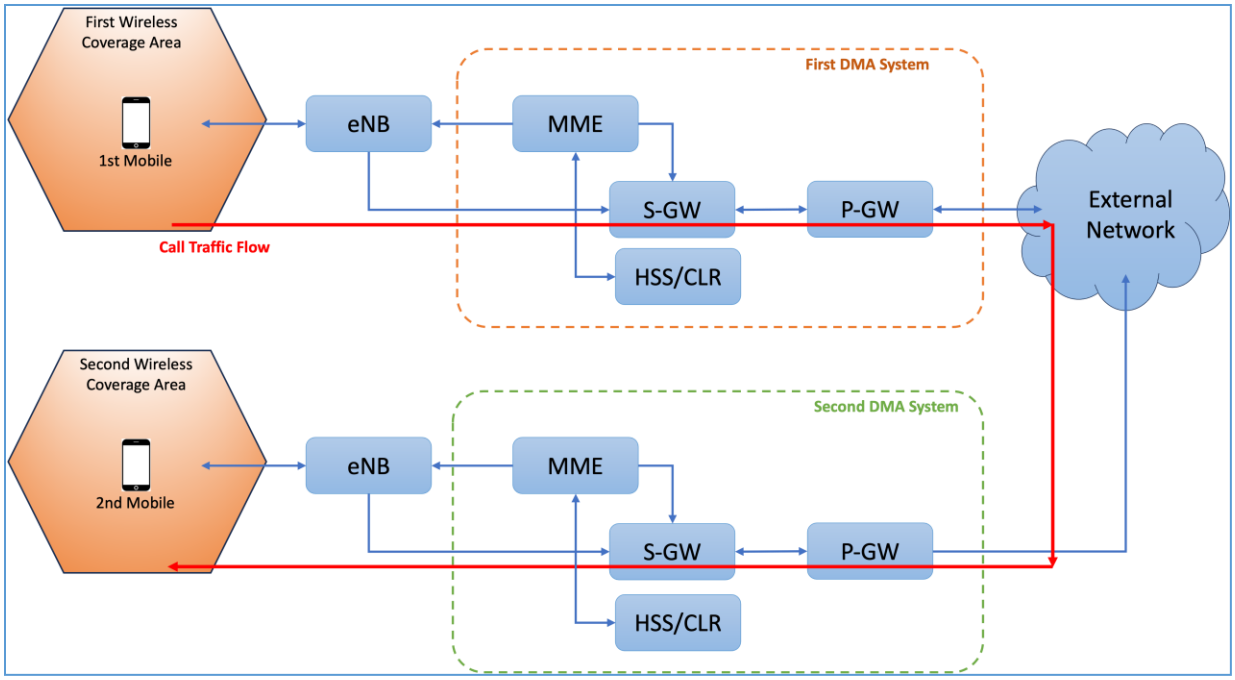


Exhibit 41 (3GPP_TS_23.401.pdf) at 71 (showing IP address of mobile device in the user plane); Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 1, 3 (vEPC, which is

Affirmed Mobile Core, supports 3GPP compliant open architecture including SGSN, MME, GGSN, SGW, and PGW).

221. **Initiating connection of the call from the first mobile subscriber to the second mobile subscriber via the first DMA system and the second DMA system when the second mobile subscriber is registered with the second DMA system**: APNS' Affirmed Mobile Core initiates the connection for a call between the first and the second mobile subscribers at the first and second Affirmed Mobile Core nodes (first and second DMA systems). The packets transmitted by the first mobile subscriber pass through the user plane of the first Affirmed Mobile Core node (SGW and PGW) out to the external IP network which routes the packet to the destination Affirmed Mobile Core node based on the destination IP address in the packet, which is the CLR information. Exhibit 28 at 4 ("APNS delivers seamless mobility across multiple enterprise sites through its distributed subscriber core and provides full mobility between private and public networks."). The CLR is used to determine if the second mobile subscriber is registered with the first or second Affirmed Mobile Core node (DMA system). Upon reception of the IP packet at the PGW of the second Affirmed Mobile Core node, the packet is routed to the appropriate mobile device through the user plane of the second Affirmed Mobile Core node (the PGW to the SGW, and to the eNodeB and the user).



The above diagram was created as a demonstrative to illustrate the flow of call data through the user plane of the first and second Affirmed Mobile Core nodes.

222. Once the destination of the call is determined to be a mobile subscriber registered with the second Affirmed Mobile Core node (DMA system), the MME of each Affirmed Mobile Core node establishes a connection for the call data through the SGW and PGW modules of each respective system. Thus, the call is connected from the first mobile subscriber through the first DMA system to the second mobile subscriber through the second DMA system (with the external network being the intermediary).

223. Defendants' infringement of the '111 Patent has injured and continues to injure Lemko in an amount to be proven at trial, but not less than a reasonable royalty. Defendants' infringement has caused and is continuing to cause irreparable injury to Lemko, and Lemko will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by this Court.

224. Pursuant to 35 U.S.C. §§ 283, 284, and 285, Lemko is entitled to injunctive relief, damages, and attorney's fees and costs.

COUNT X
(Indirect Infringement of the '111 Patent)

225. Lemko repeats, realleges, and incorporates by reference, as if fully set forth herein, the allegations of the preceding paragraphs.

226. Defendants' customers directly infringe the '111 Patent when they use or assemble APNS as an operating network, for example by installing Affirmed Mobile Core in APNS on ASE servers and connecting those servers to BTSs, thereby making an infringing network. Defendants have induced and contributed to their customers' direct infringement of the '111 Patent under 35 U.S.C. § 271(b) by instructing and encouraging their customers' infringing use and making of APNS as a system infringing at least exemplary Claim 15.

227. Defendants know about the '111 Patent and that APNS infringe the '111 Patent, at least from their receipt of Lemko's February 14, 2022 Complaint, December 20, 2022 Preliminary Infringement Contentions, and October 19, 2023 First Amended Complaint.

228. Lemko's Complaint identifies the Asserted Patents and the Accused Products, states that Defendants are infringing, and explains Defendants' infringement of the '111 Patent. Doc. 1 at ¶¶ 183-216.

229. Lemko's First Amended Complaint specifically identifies the Asserted Patents and the Accused Products, states that Defendants are infringing, and explains Defendants' infringement of the '111 Patent. Doc. 59 at ¶¶ 189-213.

230. Appx. E-1 to Lemko's Preliminary Infringement Contentions, Exhibit 34 hereto, provides a detailed disclosure of Defendants' infringement of the '111 Patent.

231. This Second Amended Complaint further places Defendants on specific notice that they are infringing and contributing to and inducing customers' infringement of the '111 Patent.

232. Defendants knowingly and actively aided and abetted their customers' direct infringement of the '111 Patent. As discussed above, APNS infringes the '111 Patent. Defendants instruct and encourage their customers on how to use each of these important features of APNS, particularly the ASE servers and the Affirmed Mobile Core functions, including managing the ASE servers, connecting mobile calls in multiple mobile coverage areas, transferring mobile calls directed to different network domains, and configuring the SIM or partner applications in service portals. Defendants do so through trainings, reference materials, user manuals, user guides, promotional materials, and by providing customer support, which are all intended to enable and encourage customers' purchase, installation, and use of APNS, including how to install Affirmed Mobile Core on ASE servers, configure APNS in Azure Network Function Manager, and operate APNS in the ecosystem provided in Microsoft Azure marketplace.

233. Defendants operate an online site called "Azure Community Support," with discussions and articles covering the use of Azure Stack Edge, which when combined with Affirmed Mobile Core, makes up APNS. Exhibit 42 (https://azure.microsoft.com/en-us/support/community/). Azure Community Support covers in-depth installing and configuring ASE servers, and includes tutorials and manuals for installing and configuring ASE servers. Defendants also publish a variety of product documentation that describe APNS' functionality. *See, e.g.*, Exhibit 31, (https://www.affirmednetworks.com/asset-type/white-papers/) (listing Affirmed Networks white papers). Defendants also provide product blog posts

that cover Affirmed Mobile Core's infringing features and instruct customers on how to configure and use Affirmed Mobile Core (which is a key component of APNS). *See, e.g.*, Exhibit 32 (https://www.affirmednetworks.com/blog/) (listing Affirmed Networks blog posts, including on vEPC, which is now Affirmed Mobile Core).

234. In addition, Defendants support customers' use and configuration of APNS through a dedicated support center. Exhibit 33 (https://www.affirmednetworks.com/support/) ("Affirmed Networks' 24/7/365 global support team ensures rapid response times to assist communication service providers (CSPs) no matter where they are in their virtualization journey, from initial network design to system integration and post-production support, for 2G, 3G, 4G, and 5G networks.").

235. Defendants are also liable for contributory infringement of the '111 Patent pursuant to 35 U.S.C. § 271(c) by knowing or being willfully blind to the fact that they are contributing to infringement of at least exemplary Claim 15 by offering to sell and selling APNS in the United States. The APNS software and ASE servers that Defendants provide is, at a minimum, a material component of the system that infringes Claim 15 of the '111 Patent.

236. The APNS software, which provides Affirmed Mobile Core-UP (DMA) and Affirmed Mobile Core-CP (DMAG) interface functionality, is not a staple article or commodity of commerce suitable for substantial noninfringing use. The function of APNS is to provide the accused mobile networks, which infringe when they operate as described above for Count IX, and they have no purpose other than to be used to provide the accused mobile networks. Defendants therefore know or are willfully blind to the fact that they are contributing to their customers' infringement of the '111 Patent, including Claim 15.

237. Defendants' indirect infringement of the '111 Patent has injured and continues to injure Lemko in an amount to be proven at trial, but not less than a reasonable royalty. Lemko will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by the Court.

238. Pursuant to 35 U.S.C. §§ 283, 284, and 285, Lemko is entitled to injunctive relief, damages, and attorney's fees and costs.

COUNT XI
(Direct Infringement of the '980 Patent)

239. Lemko repeats, realleges, and incorporates by reference, as if fully set forth herein, the allegations of the preceding paragraphs, as set forth above.

240. In violation of 35 U.S.C. § 271(a), Defendants directly infringe at least exemplary Claim 1 of the '980 Patent by making, using, importing, selling, and offering for sale in the United States at least Affirmed Mobile Core, which performs the method of Claim 1, without the permission, consent, authorization, or license of Lemko.

241. Defendants' infringement is based upon literal infringement or, at the very least, infringement under the doctrine of equivalents.

242. Defendants are the final assembler of the infringing system because they provide the Affirmed Mobile Core service that performs the claimed method. Defendants provide, install, and configure the Affirmed Mobile Core software on servers and connect those servers to base transceiver stations, such as eNodeBs (as discussed below), thereby making the infringing system. Further evidence that Defendants are the final assembler of the infringing network is that they sell and offer for sale Affirmed Mobile Core as a paid service for their customers. In that scenario, Defendants own and operate the servers that run the Affirmed Mobile Core software for their customers' networks, install the software on their servers,

configure the software, and connect the servers running the Affirmed Mobile Core software to their customers' BTSs, such as eNodeBs. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) shows that Defendants offer and sell the service of configuring and operating Affirmed Mobile Core as a service for their customers.

243. Microsoft and Affirmed Networks directly infringe by operating as a joint enterprise with respect to making, using, importing, selling, and offering for sale Affirmed Mobile Core. Affirmed Networks is a subsidiary of Microsoft, and Defendants cooperate to make, use, market, sell and offer for sale Affirmed Mobile Core by itself, and Affirmed Mobile Core in combination with Microsoft ASE servers. Defendants together provide the services of managing and configuring the APNS solution, which includes Affirmed Mobile Core. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) at 1-2.

244. Defendants further directly infringe by directing and controlling the infringing systems, and obtaining benefits from their control of the systems as a whole when Defendants configure and maintain the infringing systems as a paid service for their customers. Under this scenario, discussed above, Defendants provide Affirmed Mobile Core in combination with Microsoft Azure's capabilities to make a network that Microsoft manages, and thereby controls, as a service for mobile network operators and other customers. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) at 1.

245. As shown below, Affirmed Mobile Core performs all of the steps of the method of Claim 1 of the '980 Patent.

246. **A method to receive a first call associated with a destination device from a first mobile device at a first BTS interface of a first DMA server wherein the first call is associated with a destination device**: Affirmed Mobile Core receives a call from a mobile

device (a first call from a first mobile device) at an eNodeB interface (the first BTS interface) of an ASE server or a virtual machine hosting Affirmed Mobile Core SGW/PGW (a first DMA sever). The Affirmed Mobile Core SGW/PGW receive the first call from the eNodeB via an S1-u interface (a first BTS interface). Exhibit 40 at 39 (Affirmed Mobile Core uses S1-U for connecting to eNodeB).[25]

4.2 Architecture reference model

4.2.1 Non-roaming architecture

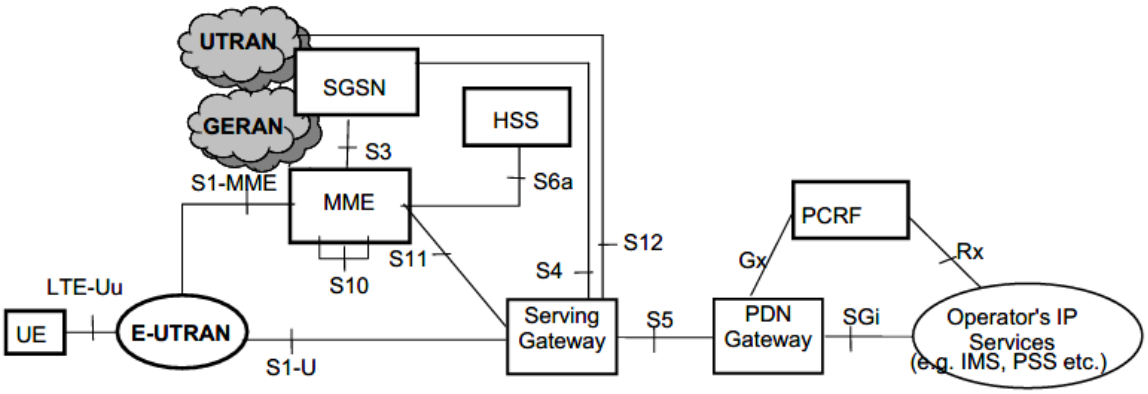


Figure 4.2.1-1: Non-roaming architecture for 3GPP accesses

[25] Exhibit 25 is a manual for Mobile Content Cloud, which provides virtualized EPC (vEPC) functionalities. Exhibit 25 at 1-2 ("The Affirmed Networks Mobile Content Cloud is a virtualized EPC (vEPC) . . . solution"). As discussed above, Defendants previously marketed their mobile core software as vEPC, and now market it as Affirmed Mobile Core and Affirmed Mobile Content Cloud. Exhibit 13 (Affirmed Intel vEPC Performance Report.pdf) at 1, 2 ("Affirmed Mobile Content Cloud (MCC) . . . offers . . . vEPC functionality" and describing tests of Affirmed Mobile Core as testing of Affirmed vEPC). As shown in the manual, the Affirmed Mobile Core software (referred to as Mobile Content Cloud) is 3GPP compliant. Exhibit 25 at 1-16. This includes providing SGSN, MME, GGSN, SGW and PGW functionality to support network services in 2G, 3G, 4G, LTE, and VoLTE mobile networks. *Id.*; Exhibit 46 (3GPP.pdf) at 1 (3GPP specifications cover cellular telecommunications technologies).

Exhibit 41 (3GPP_TS_23.401.pdf) at 16 (showing S1-U interface connecting the E-UTRAN (the radio access network) to the SGW, which is the DMA server);[26] Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 1, 3 (vEPC, which is Affirmed Mobile Core, supports 3GPP compliant open architecture including SGSN, MME, GGSN, SGW, and PGW).

247. **Determining that a first DMAG supports communication with the destination device based on registration data stored at the first DMA server**: Affirmed Mobile Core uses subscriber information such as the location of the destination mobile device (registration data) stored in the HSS at the ASE or the virtual machine node that hosts the SGW/PGW (first DMA server) to determine if the SGW/PGW (first DMAG) support communication with the destination mobile device based on. The information stored at the HSS includes the "MME Identity," which indicates the MME currently serving this subscriber, the "PGW identity," which indicates the PGW (or PGWs for connections to multiple PDNs) serving this subscriber, and the "PDN Address," which is the IP address for this subscriber (for each PDN it is connected to). Exhibit 41 (3GPP_TS_23.401.pdf) 196-97. The identities of the MME and the PGW serving the mobile device are also stored in the HSS. *Id.* at 196.

248. **Wherein the registration data indicates that the destination device is not within a wireless coverage area associated with the first DMA server**: As discussed above, Affirmed Mobile Core stores the first registration data at the first DMA server. The data include an hss-hlr-routing table "configured on the SGSN" that stores the International Mobile

[26] Exhibit 41 (3GPP_TS_23.401.pdf) describes the 3GPP standard, including its functionality for roaming and non-roaming scenarios and covers mobility between 3GPP radio access technologies, policy control, charging, and authentication. Exhibit 41 (3GPP_TS_23.401.pdf) at 10-11. Affirmed Mobile Core is 3GPP complaint, meaning that it provides the functionality described in the 3GPP standard. Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 3 (describing its 3GPP compliance).

Subscriber Identity ("IMSI") range of the mobile device of subscribers. Exhibit 27 at 34.[27] Affirmed Mobile Core also stores registration data at the ASE server or virtual machine node that hosts the SGW/PGW (the first DMA server) by including a mobile device pool which is used by the "hairpinning" feature to determine whether or not the mobile device is attached to the SGW/PGW (first DMA system). If it is attached, the call can be locally routed back into the system without traversing an external network.

249. Affirmed Mobile Core determines from the data regarding the location of the destination mobile device (registration data) that the destination device is not within a wireless coverage area associated with the ASE or virtual machine node that hosts the SGW/PGW (first DMA server). The SGW/PGW will handle the calls based on the location information for all services including video, audio, or text over the networks. The HSS identifies the physical location of the destination mobile device in the roamer list, if it is outside of the wireless coverage of the first DMA server. Subscribers are "classified as home or visiting" based on the subscriber's PLMNID (Public Land Mobile Network ID) and the GW PLMNID configuration. Exhibit 25 at 7-27.

250. **The first DMAG is communicatively coupled to a plurality of DMA servers including the first DMA server**: The SGW/PGW (first DMAG) is coupled to the ASE servers or the virtual machine nodes that host SGWs/PGWs (a plurality of servers including the first DMA server as well as other servers hosting SGWs/PGWs) through the network interfaces or the node pool, including MME/SGSN virtual machine nodes pool. Exhibit 27 at 23, 68.

[27] This document (Affirmed Networks vMME Operator Guide) provides configuration procedures for the MME and the SGSN in vEPC. Exhibit 27 at 1. As discussed above, Defendants now market vEPC as Affirmed Mobile Core.

Table 4. VM Type to MME Application Mapping

Virtual Machine Type	MME Application
MGMT	CM, PM, FM, CSL, Trace
RM	RM, LI, SBc, UPSM, S1M
CALLP	SC, SGs, DC, SLs
SIG	UPM, S1
SLB	LB

Exhibit 27 at 23 (showing the virtual machines including MME applications).

251. The first DMA server coupled to the first DMAG connects to the second DMA server through the S5/S8 interface. Exhibit 25 at 7-29; *id*. at 7-6. Using the S5/S8 interface, the first DMA server (ASE server or virtual machine node) that is coupled to the SGW (the first DMAG) connects to the second DMA server (ASE server or virtual machine node) that is coupled to the PGW.

252. **Converting first voice information associated with the first call to first packet data**: Affirmed Mobile Core converts voice content (first voice call information) to IP packets (first packet data) and routes the first voice call through the S5/S8 network interfaces. Voice information from a VoLTE call, which originates at a first mobile device, is converted to different packet data formats along the user plane corresponding to the different interfaces. The E-UTRAN connects Affirmed Mobile Core via the S1-U interface; SGWs and PGWs connect via the S5/S8 interface; and the SGi interface connects the Affirmed Mobile Core to the external IP network.

4.2 Architecture reference model

4.2.1 Non-roaming architecture

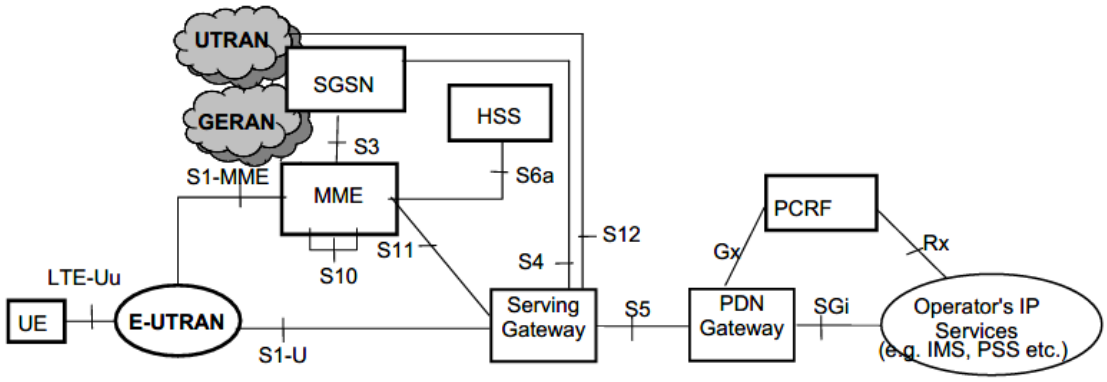


Figure 4.2.1-1: Non-roaming architecture for 3GPP accesses

Exhibit 41 (3GPP_TS_23.401.pdf) at 16 (showing the call information flows from mobile device to SGW, SGW to PGW, and PGW to an external IP network through the S1-U interface, the S5/S8 interface, and the SGi interface); Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 1, 3 (vEPC, which is Affirmed Mobile Core, supports 3GPP compliant open architecture including SGSN, MME, GGSN, SGW, and PGW).

253. **Routing the first packet data to the destination device via the first DMAG**: Affirmed Mobile Core routes the voice data (first packet data) to the destination mobile device via the SGW/PGW (first DMAG), including the SGW for "handoff between the RAN [(radio access network)] and core network" and PGW "for interconnect between the core and external IP networks." Exhibit 11 at 4. The PGW routes the packets to and from the packet data network, serving as the point of interconnect between Affirmed Mobile Core and a second DMA server. Exhibit 25 at 7-6 (PGW supports "the packet filtering function for each user, charging support, and lawful interception."). The PGW/SGW monitors "the transit time for a packet processing through SAWGW complex." *Id*. at 7-8.

254. Moreover, Affirmed Mobile Core employs a "Hairpinning" feature for routing packet data to the destination device via the SGW/PGW (first DMAG). The hairpinning feature enables the gateway traffic to hairpin locally from mobile device to mobile device without going out the Gi interface between the GGSN and a public domain network. Exhibit 25 at 7-16. In this case, the system receives traffic from a mobile device for a particular session and makes a forwarding decision based on the destination IP address in the received packet. *Id*.

255. Defendants' infringement of the '980 Patent has injured and continues to injure Lemko in an amount to be proven at trial, but not less than a reasonable royalty. Defendants' infringement has caused and is continuing to cause irreparable injury to Lemko, and Lemko will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by this Court.

256. Pursuant to 35 U.S.C. §§ 283, 284, and 285, Lemko is entitled to injunctive relief, damages, and attorney's fees and costs.

COUNT XII
(Indirect Infringement of the '980 Patent)

257. Lemko repeats, realleges, and incorporates by reference, as if fully set forth herein, the allegations of the preceding paragraphs.

258. Defendants' customers directly infringe the '980 Patent when they use or assemble Affirmed Mobile Core as an operating network, for example by installing Affirmed Mobile Core software on servers and connecting those servers to BTSs, thereby making an infringing network. Defendants have induced and contributed to their customers' direct infringement of the '980 Patent under 35 U.S.C. § 271(b) by instructing and encouraging their

customers infringing use and making of Affirmed Mobile Core as a system infringing at least exemplary Claim 1.

259. Defendants know about the ’980 Patent and that Affirmed Mobile Core infringe the ’980 Patent, at least from their receipt of Lemko’s February 14, 2022 Complaint, December 20, 2022 Preliminary Infringement Contentions, and October 19, 2023 First Amended Complaint.

260. Lemko’s Complaint specifically identifies the Asserted Patents and the Accused Products, states that Defendants are infringing, and explains Defendants’ infringement of the ‘980 Patent. Doc. 1 at ¶¶ 217-246.

261. Lemko’s First Amended Complaint specifically identifies the Asserted Patents and the Accused Products, states that Defendants are infringing, and explains Defendants’ infringement of the ‘980 Patent. Doc. 59 at ¶¶ 214-235.

262. Appx. F-1 to Lemko’s Preliminary Infringement Contentions, Exhibit 35 hereto, provides a detailed disclosure of Defendants’ infringement of the ‘980 Patent.

263. This Second Amended Complaint further places Defendants on specific notice that they are infringing and contributing to and inducing customers’ infringement of the ‘980 Patent.

264. Defendants knowingly and actively aided and abetted their customers’ direct infringement of the ’980 Patent. As discussed above, Affirmed Mobile Core infringes the ’980 Patent by providing call routing and management functionality. Defendants instruct and encourage their customers on how to use these important features of Affirmed Mobile Core, including through trainings, reference materials, user manuals, user guides, promotional materials, and by providing customer support, which are all intended to enable and encourage

customers' purchase, installation, and use of Affirmed Mobile Core, including its call routing and management functionality. For example, Defendants publish a variety of product documents that that describe functionality of Affirmed Mobile Core. *See, e.g.*, Exhibit 31, (https://www.affirmednetworks.com/asset-type/white-papers/) (listing Affirmed Networks white papers). Defendants also provide product blog posts that cover Affirmed Mobile Core's infringing features and instruct customers on how to configure and use Affirmed Mobile Core. *See, e.g.*, Exhibit 32 (https://www.affirmednetworks.com/blog/) (listing Affirmed Networks blog posts, including on vEPC, which is now Affirmed Mobile Core).

265. In addition, Defendants support customers' use and configuration of Affirmed Mobile Core through a dedicated support center. Exhibit 33 (https://www.affirmednetworks.com/support/) ("Affirmed Networks' 24/7/365 global support team ensures rapid response times to assist communication service providers (CSPs) no matter where they are in their virtualization journey, from initial network design to system integration and post-production support, for 2G, 3G, 4G, and 5G networks.").

266. In addition, Defendants operate an online site called "Azure Community Support," with discussions and articles covering the use of ASE servers, which are used with Affirmed Mobile Core in an infringing manner (as described above). Exhibit 42 (https://azure.microsoft.com/en-us/support/community/). Azure Community Support provides in-depth instructions for installing and configuring ASE servers.

267. Defendants are also liable for contributory infringement of the '980 Patent pursuant to 35 U.S.C. § 271(c) by knowing or being willfully blind to the fact that they are contributing to their customers' infringement of at least exemplary Claim 1 by offering to sell and selling Affirmed Mobile Core in the United States. The Affirmed Mobile Core software

that Defendants provide is, at a minimum, a material component of the system that infringes Claim 1 of the ’980 Patent.

268. Affirmed Mobile Core is not a staple article or commodity of commerce suitable for substantial noninfringing use. The function of Affirmed Mobile Core is to provide the accused mobile networks, which infringe when they operate as described above for Count XI, and they have no purpose other than to be use to provide the accused mobile networks. Defendants therefore know or are willfully blind to the fact that they are contributing to their customers’ infringement of the ’980 Patent, including Claim 1.

269. Defendants’ indirect infringement of the ’980 Patent has injured and continues to injure Lemko in an amount to be proven at trial, but not less than a reasonable royalty. Lemko will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by the Court.

270. Pursuant to 35 U.S.C. §§ 283, 284, and 285, Lemko is entitled to injunctive relief, damages, and attorney’s fees and costs.

COUNT XIII
(Direct Infringement of the ‘478 Patent)

271. Lemko repeats, realleges, and incorporates by reference, as if fully set forth herein, the allegations of the preceding paragraphs, as set forth above.

272. In violation of 35 U.S.C. § 271(a), Defendants directly infringe at least exemplary Claim 16 of the ’478 Patent by making, using, importing, selling, and offering for sale in the United States at least APNS without the permission, consent, authorization, or license of Lemko.

273. Defendants’ infringement is based upon literal infringement or, at the very least, infringement under the doctrine of equivalents.

274. Defendants directly infringe by acting as the final assembler of the infringing apparatus. Defendants are the final assembler of the infringing apparatus because they combine as an APNS bundle Affirmed Mobile Core software with an Azure Stack Edge Server to create "a complete turkey solution for private LTE/5G networks," thereby making the infringing apparatus. Exhibit 17, Microsoft Azure Marketplace_APNS.pdf at 1. Further evidence that Defendants are the final assembler of the infringing apparatus is that they sell and offer for sale APNS as a paid service for their customers. In that scenario, Defendants own and operate the servers that run APNS software to operate their customers' networks, install the software on their servers, configure the software, and connect the servers running APNS to their customers' BTSs (wireless transceivers), such as eNodeBs. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) shows that Defendants offer and sell the service of configuring and operating an Affirmed Mobile Core system as part of providing APNS.

275. Microsoft and Affirmed Networks directly infringe by operating as a joint enterprise with respect to making, using, marketing, importing, selling, and offering for sale APNS, including as a combination of the Affirmed Networks Affirmed Mobile Core software and Microsoft ASE servers. Affirmed Networks is a subsidiary of Microsoft, and Defendants cooperate to provide the services of managing and configuring the APNS solution. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) at 1-2.

276. Defendants further directly infringe by directing and controlling the infringing systems, and obtaining benefits from their control of the infringing apparatus as a whole when Defendants configure and maintain the infringing systems as a paid service for their customers. Under this scenario, discussed above, as part of APNS Defendants provide Affirmed Mobile Core software in combination with Microsoft Azure's capabilities to make a network that

Microsoft manages, and thereby controls, as a service for mobile network operators and other customers. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) at 1.

277. As shown below, APNS includes all of the elements of the apparatus of Claim 16 of the '478 Patent.

278. **A first DMAG**: The Affirmed Mobile Core software in APNS includes SGW and PGW modules, a first and second DMAG. The SGW is the point of interconnect between the RAN (eNodeB) and Affirmed Mobile Core, and serves mobile devices by routing incoming and outgoing packets. The PGW provides connectivity to "the external packet data network" and serves as "an anchor point for any connectivity to the external data network." Exhibit 25 at 7-2. The PGW performs policy enforcement, packet filtering for each user, and provides charging support. *Id*.

279. **A first interface configured to communicate with a legacy communication network**: Affirmed Mobile Core in APNS includes Lu, Gb, and SGs interfaces for communicating with legacy communication networks. The Lu interface for UMTS/3G (a legacy network) communicates with "the radio access equipment (e.g., [Radio Network Controller] then BTS) that runs over IP mechanism." Exhibit 27 at 78.[28] The Gb interface communicates with General Packet Radio Service ("GPRS")/2G equipment (Packet Control Unit then BTS) that "supports IP (Internet Protocol) or FR (Frame Relay) transport." *Id*. at 81. The SGs interface connects MME to the MSC/VLR to provide "Circuit Switched Fallback to GSM or UMTS," two of the legacy networks. *Id*. at 47.

[28] This document (Affirmed Networks vMME Operator Guide) provides configuration procedures for the MME and the SGSN in vEPC. Exhibit 27 at 1. As discussed above, Defendants now market vEPC as Affirmed Mobile Core.

280. **A second interface configured to communicate with a private IP network**: APNS' Affirmed Mobile Core includes an S11 interface, which is a second interface and connects the SGW to the MME within the Affirmed Mobile Core of the APNS, a private IP network. Exhibit 16, Affirmed Private Network Service (APNS).pdf at 1 (APNS is a fully managed private network solution to deliver private LTE/5G network service to an enterprise).

281. **A third interface configured to communicate with a DMA gateway communication network**: APNS' Affirmed Mobile Core includes an S5/S8 interface (a third interface) between the SGW(the first DMAG) and the PGW (the second DMAG) to form a DMAG communication network.

282. **A server having logic configured to transmit communications information to a second DMAG of the DMAG communication network, wherein the communications information is associated with a communication network that is accessible to the first DMAG**: APNS includes an ASE or a virtual machine running Affirmed Mobile Core (a DMA server) having logic to transmit communications information to the PGW (second DMAG) of the DMAG communication network. The SGW and the PGW are the first and the second DMAGs connected through the S5/S8 interface, or 3G, 4G, 5G, wireless local area network, or Internet connections (DMAG communication network).

283. The communications information includes Create Session Request message when a mobile device attaches to a mobile network. When the mobile device joins a network that is accessible to the first DMAG (the SGW or PGW), the MME sends "Create Session Request" to the SGW. Exhibit 44, 3GPP_TS_29.274.pdf at 28 (list of all GTP message types).[29] This request message subsequently flows from the SGW to the PGW. *Id*. at 35. The

[29] The Affirmed Mobile Core software in APNS is compliant with the 3GPP technical

Create Session Request message is transmitted from the MME to the SGW through the S11 interface and from the SGW to the PGW through the S5/S8 interface. *Id*. at 35-36. The Create Session Request message includes International Mobile Subscriber Identity ("IMSI") to identify mobile device, serving network information, and packet data network ("PDN") type. *Id*. at 38-50.

284. **The communication network and the DMA gateway communication network are different**: The associated communication network is different from the DMAG communication network because the communication network is the mobile or telephone network communicating to the mobile device, and the DMAG communication network is the network connecting the first and second DMAG.

285. **The first DMAG is associated with a first group of DMA servers and the second DMAG is associated with a second group of DMA servers different from the first group:** MME nodes (DMA servers) are associated with the SGW (first DMAG). The PCRF servers or servers for the Value-Added services associated with the second DMAG (PGW) are a second group of DMA servers different from the first group of DMA servers.

286. **The communications information identifies each DMA server of the first group of DMA servers**: The communications information identifies each DMA server within the first group of DMA servers, which are MMEs, associated with the first DMAG (SGW). The Create Session Request message includes an MME information element that will identify the MMEs (DMA servers).

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specification. Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 3 (describing its 3GPP compliance). Exhibit 44 (3GPP_TS_29.274.pdf) is a 3GPP specification regarding the control of the GPRS Tunneling Protocol. Exhibit 44 (3GPP_TS_29.274.pdf) at 11-12.

MME/S4-SGSN LDN	O	This IE is optionally sent by the MME to the SGW on the S11 interface and by the SGSN to the SGW on the S4 interface (see 3GPP TS 32.423 [44]), when communicating the LDN to the peer node for the first time.	Local Distinguished Name (LDN)	0
SGW LDN	O	This IE is optionally sent by the SGW to the PGW on the S5/S8 interfaces (see 3GPP TS 32.423 [44]), for inter-SGW mobity, when communicating the LDN to the peer node for the first time.	Local Distinguished Name (LDN)	1
H(e)NB Local IP Address	CO	The MME/SGSN shall include this IE on S11/S4 interface if the PGW/PCRF has requested H(e)NB information reporting and the MME/SGSN has received this information from H(e)NB in UE associated S1/Iu signalling	IP Address	0

Exhibit 43 (3GPP_TS_29.274.pdf) at 93 (Create Session Request message format includes the MME local distinguished name to identify the MME); Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 1, 3 (vEPC, which is Affirmed Mobile Core, supports 3GPP compliant open architecture including SGSN, MME, GGSN, SGW, and PGW).

287. **Receive a communication from the second DMA gateway via the DMA gateway communication network**: APNS receives the communication from the second DMAG (SGW/PGW) via the DMAG communication network. The first and second DMAGs (SGW and PGW) connect by a DMAG communication network through the S5/S8 interface. Exhibit 25 at 7-6. The received communication includes packet data in Voice, VoWiFi, and Video.

288. **The communication is associated with a destination device that is indicated by the communications information to be served by the communication network that is accessible to the first DMAG:** The communications information includes user location information ("ULI") to indicate that the communication network is accessible to the first DMAG (SGW). The IMSI and serving network from Create Session Request indicate if the communication network serves the destination mobile device, as shown below.

Table 7.2.1-1: Information Elements in a Create Session Request

Information elements	P	Condition / Comment	IE Type	Ins.
IMSI	C	The IMSI shall be included in the message on the S4/S11 interface, and on S5/S8 interface if provided by the MME/SGSN, except for the case: - If the UE is emergency attached and the UE is UICCless. The IMSI shall be included in the message on the S4/S11 interface, and on S5/S8 interface if provided by the MME/SGSN, but not used as an identifier - if UE is emergency attached but IMSI is not authenticated. The IMSI shall be included in the message on the S2a/S2b interface, except for the case: - if the UE is emergency attached and the UE is UICCless. The IMSI shall be included in the message on the S2a/S2b interface, but not used as an identifier: - if UE is emergency attached but IMSI is not authenticated.	IMSI	0

Exhibit 43 (3GPP_TS_29.274.pdf) at 38 (Create Session Request message format including IMSI). The second DMAG (PGW) uses Evolved Packet System ("EPS") bearers to establish a communication channels for the packet data to flow from the PGW to the SGW (the first DMAG).

289. **Route the communication to the destination device**: APNS routes the communication to the destination mobile device. The packet data are sent from the PGW (the second DMAG) to the SGW (the first DMAG). The SGW, "transmits and receives user data packets from mobile base stations (eNodeB)[.]" Exhibit 25 at 7-2. The PGW transmits the packet data to the external network and the SGW, and to the destination device (mobile device).

4.2.1 Non-roaming architecture

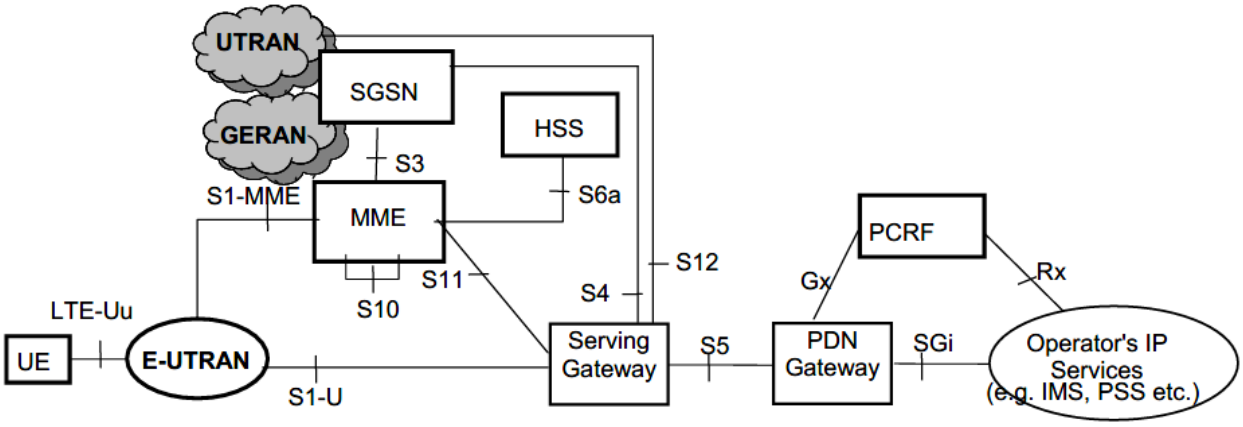

Figure 4.2.1-1: Non-roaming architecture for 3GPP accesses

Exhibit 41 (3GPP_TS_23.401.pdf) at 16 (showing the PGW's connection to the SGW and mobile device);[30] Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 1, 3 (vEPC, which is Affirmed Mobile Core, supports 3GPP compliant open architecture including SGSN, MME, GGSN, SGW, and PGW).

290. Defendants' infringement of the '478 Patent has injured and continues to injure Lemko in an amount to be proven at trial, but not less than a reasonable royalty. Defendants' infringement has caused and is continuing to cause irreparable injury to Lemko, and Lemko will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by this Court.

291. Pursuant to 35 U.S.C. §§ 283, 284, and 285, Lemko is entitled to injunctive relief, damages, and attorney's fees and costs.

[30] Exhibit 41 (3GPP_TS_23.401.pdf) describes the 3GPP standard, including its functionality for roaming and non-roaming scenarios and covers mobility between 3GPP radio access technologies, policy control, charging, and authentication. Exhibit 41 (3GPP_TS_23.401.pdf) at 10-11. Affirmed Mobile Core is 3GPP complaint, meaning that it provides the functionality described in the 3GPP standard. Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 3 (describing its 3GPP compliance).

COUNT XIV
(Indirect Infringement of the '478 Patent)

292. Lemko repeats, realleges, and incorporates by reference, as if fully set forth herein, the allegations of the preceding paragraphs.

293. Defendants' customers directly infringe the '478 Patent when they use or assemble APNS as an operating network, for example by installing Affirmed Mobile Core in APNS on ASE servers and connecting those servers to BTSs, thereby making an infringing network. Defendants have induced and contributed to their customers' direct infringement of the '478 Patent under 35 U.S.C. § 271(b) by instructing and encouraging their customers' infringing use and making of APNS as a system infringing at least exemplary Claim 16.

294. Defendants know about the '478 Patent and that APNS infringes the '478 Patent, at least from their receipt of Lemko's February 14, 2022 Complaint and December 20, 2022 Preliminary Infringement Contentions, and October 19, 2023 First Amended Complaint.

295. Lemko's Complaint specifically identifies the Asserted Patents and the Accused Products, states that Defendants are infringing, and explains Defendants' infringement of the '478 Patent. Doc. 1 at ¶¶ 247-280.

296. Lemko's First Amended Complaint specifically identifies the Asserted Patents and the Accused Products, states that Defendants are infringing, and explains Defendants' infringement of the '478 Patent. Doc. 59 at ¶¶ 236-258.

297. Appx. G-1 to Lemko's Preliminary Infringement Contentions, Exhibit 38 hereto, provides a detailed disclosure of Defendants' infringement of the '478 Patent.

298. This Second Amended Complaint further places Defendants on specific notice that they are infringing and contributing to and inducing customers' infringement of the '478 Patent.

299. Defendants knowingly and actively aided and abetted their customers' direct infringement of the '478 Patent. As discussed above, APNS infringes the '478 Patent. Defendants instruct and encourage their customers on how to use each of these important features of APNS, particularly configuring the private network to interconnect with legacy networks. Defendants do so through trainings, reference materials, user manuals, user guides, promotional materials, and by providing customer support, which are all intended to enable and encourage customers' purchase, installation, and use of APNS, including how to install APNS on ASE servers and configure the network interconnections.

300. Defendants operate an online site called "Azure Community Support," with discussions and articles covering the use of Azure Stack Edge, which when combined with Azure cloud and Affirmed Mobile Core, makes up APNS. Exhibit 42 (https://azure.microsoft.com/en-us/support/community/). Azure Community Support covers in-depth installing and configuring ASE servers, and includes tutorials and manuals for installing and configuring ASE servers. Defendants also publish a variety of product documentation that describe APNS' functionality. *See, e.g.*, Exhibit 31, (https://www.affirmednetworks.com/asset-type/white-papers/) (listing Affirmed Networks white papers). Defendants also provide product blog posts that cover Affirmed Mobile Core's infringing features and instruct customers on how to configure and use Affirmed Mobile Core (which is a key component of APNS). *See, e.g.*, Exhibit 32 (https://www.affirmednetworks.com/blog/) (listing Affirmed Networks blog posts, including on vEPC, which is now Affirmed Mobile Core).

301. In addition, Defendants support customers' use and configuration of APNS through a dedicated support center. Exhibit 33 (https://www.affirmednetworks.com/support/)

("Affirmed Networks' 24/7/365 global support team ensures rapid response times to assist communication service providers (CSPs) no matter where they are in their virtualization journey, from initial network design to system integration and post-production support, for 2G, 3G, 4G, and 5G networks.").

302. Defendants are also liable for contributory infringement of the '478 Patent pursuant to 35 U.S.C. § 271(c) by knowing or being willfully blind to the fact that they are contributing to their customers' infringement of at least exemplary Claim 16 by offering to sell and selling APNS in the United States. The APNS software and ASE servers that Defendants provide is, at a minimum, a material component of the system that infringes Claim 16 of the '478 Patent.

303. The APNS software, which provides Affirmed Mobile Core-UP (DMA) and Affirmed Mobile Core-CP (DMAG) interface functionality, is not a staple article or commodity of commerce suitable for substantial noninfringing use. The function of APNS is to provide the accused mobile networks, which infringe when they operate as described above for Count XIII, and they have no purpose other than to be used to provide the accused mobile networks. Defendants therefore know or are willfully blind to the fact that they are contributing to their customers' infringement of the '478 Patent, including Claim 16.

304. Defendants' indirect infringement of the '478 Patent has injured and continues to injure Lemko in an amount to be proven at trial, but not less than a reasonable royalty. Lemko will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by the Court.

305. Pursuant to 35 U.S.C. §§ 283, 284, and 285, Lemko is entitled to injunctive relief, damages, and attorney's fees and costs.

COUNT XV
(Direct Infringement of the '931 Patent)

306. Lemko repeats, realleges, and incorporates by reference, as if fully set forth herein, the allegations of the preceding paragraphs, as set forth above.

307. In violation of 35 U.S.C. § 271(a), Defendants directly infringe at least exemplary Claim 1 of the '931 Patent by making, using, importing, selling, and offering for sale in the United States at least Affirmed Mobile Core, which performs the claimed method, without the permission, consent, authorization, or license of Lemko.

308. Defendants' infringement is based upon literal infringement or, at the very least, infringement under the doctrine of equivalents.

309. Defendants are the final assembler of the system that performs the infringing method because they provide the Affirmed Mobile Core service. Defendants provide, install, and configure the Affirmed Mobile Core software on servers and connect those servers to base transceiver stations, such as eNodeBs (as discussed below), thereby making the infringing system. Further evidence that Defendants are the final assembler of the infringing network is that they sell and offer for sale Affirmed Mobile Core as a paid service for their customers. In that scenario, Defendants own and operate the servers that run the Affirmed Mobile Core software for their customers' networks, install the software on their servers, configure the software, and connect the servers running the Affirmed Mobile Core software to their customers' BTSs, such as eNodeBs. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) shows that Defendants offer and sell the service of configuring and operating Affirmed Mobile Core as a service for their customers.

310. Microsoft and Affirmed Networks directly infringe by operating as a joint enterprise with respect to making, using, importing, selling, and offering for sale Affirmed

Mobile Core. Affirmed Networks is a subsidiary of Microsoft, and Defendants cooperate to make, use, market, sell and offer for sale Affirmed Mobile Core by itself, and Affirmed Mobile Core in combination with Microsoft ASE servers. Defendants together provide the services of managing and configuring the APNS solution, which includes Affirmed Mobile Core. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) at 1-2.

311. Defendants further directly infringe by directing and controlling the systems that performed the infringing method, and obtaining benefits from their control of the systems as a whole when Defendants configure and maintain the infringing systems as a paid service for their customers. Under this scenario, discussed above, Defendants provide Affirmed Mobile Core in combination with Microsoft Azure's capabilities to make a network that Microsoft manages, and thereby controls, as a service for mobile network operators and other customers. Exhibit 17 (Microsoft Azure Marketplace_APNS.pdf) at 1.

312. As shown below, Affirmed Mobile Core performs each of the steps of the method of Claim 1 of the '931 Patent.

313. **A method to detect a failure condition associated with a first DMAG at a DMAG management system**: Affirmed Mobile Core provides SGW and PGW functionality, operating as a first DMAG. The SGW and PGW have Acuitas Service Management System ("Acuitas") and Remote Authentication Dial in User Service ("RADIUS") functionality, which is a DMAG management system.

314. Affirmed Mobile Core includes Acuitas to "navigate, monitor, and manage mobile functions and services." Exhibit 25 at 1-9. Acuitas detects failures in the SGW or PGW (first DMAG). *Id.* at 2-1. Acuitas monitors and maintains acceptable network performance, and collects and analyzes the statistics critical to network performance. *Id.* at 2-

16. The data collected include raw performance data and KPI (Key Performance Indicator) data. *Id*. Acuitas provides "historical, real time, and outage performance reports." *Id*. at 2-17.

315. Acuitas Geographic Redundancy Group solution detects the failure condition at the first SGW/PGW (first DMAG) based on a "collaborative system of two geographically-separated chassis," as standby partners for each other. *Id*. at 6-3. Each group represents "a set of services with an active representation on the primary node and a standby representation on the secondary node." *Id*. Therefore, if the active node is out of commission, the services on the standby node can be enabled "so these services can resume." *Id*.

> The redundancy group supports the following HA modes:
>
> - *warm-manual* – No session synchronization occurs between nodes. Failovers are Operator controlled.
> - *hot-auto* – Synchronization of per-session data occurs between nodes. Failovers are automatically triggered based on network health monitoring results. In addition, failovers can be Operator controlled (using revert).
> - *hot-manual* – Synchronization of per-session data occurs between nodes. Failovers are Operator controlled.

Id. (the redundancy group support three modes to detect failure conditions). The Acuitas Geographic Redundancy Manager application manages and monitors Geographic Redundancy groups. *Id*. at 6-4.

316. In addition, the Affirmed Mobile Core software in APNS uses the RADIUS Health Check for failure detection. Exhibit 25 at 9-22. The RADIUS client receives response from the RADIUS server peer within "the configured time limit." *Id*. The health check feature detects a non-responsive remote RADIUS server, which is a failure condition, "using a counter" to track consecutive "unanswered requests." *Id*.

> *RADIUS Health Check* – The system uses the RADIUS Health Check feature to detect a non-responsive remote RADIUS server peer using a counter to track the number of consecutive unanswered requests (server-dead-num-attempts) for a given peer. If the number of consecutive unanswered requests is reached on a particular peer, the system:
>
> - Marks the peer as down
> - Generates a TRAP
> - Starts the dead server declare timer (server-dead-timeout-value)

Id. (RADIUS Health Check detects a non-responsive remote RADIUS server peer based on the number of consecutive unanswered requests, which are failure conditions).

317. **The DMAG management system is in communication with at least the first DMAG, a second DMAG, and a plurality of DMA nodes**: A plurality of DMA nodes are the edge servers (ASE) or virtual machines ("VMs") that host the SGWs or PGWs. Either the SGW or the PGW can be a first or a second DMAG. Affirmed Mobile Core uses the DMA nodes to communicate with the DMAG management system (Acuitas/RADIUS) discussed above. Affirmed Mobile Core detects a failure condition associated with a first DMAG (SGW/PGW) and a second DMAG (SGW/PGW) in communication with the DMAG management system (Acuitas/RADIUS).

318. **In response to detecting the failure condition, sending a first notification from the DMAG management system to the second DMAG to instruct the second DMAG to take over operations from the first DMAG:** The first notification instructs the second DMAG (SGW/PGW) to take over the first dMAG (SGW/PGW) in response to detecting the failure condition when the first DMAG is no longer available. The Geographic Redundancy Group sends the operator-controlled failover, which is the first notification, in its operating modes (warm-manual, hot-auto, or hot-manual). Exhibit 25 at 6-3.

319. Under RADIUS Request Timeout, the RADIUS client sends RADIUS request (the first notification) in "a round-robin approach" to select another active peer (the second DMAG) within the group in response to detecting the failure condition. *Id*. at 9-22. It transmits the request when the RADIUS client does not receive "a response from a remote RADIUS server peer within the configured time limit," which is a failure condition. *Id*.

320. **Sending a second notification from the DMAG management system to a DMA node of the plurality of DMA nodes, and the DMA node is configured to connect a call from a mobile station to an external system via the first DMAG**: Acuitas or RADIUS (the DMAG management system) may send a second notification to connect a call from a mobile device to the external system via a second DMAG (SGW/PGW) when the first DMAG is not available. The external system is an external network, such as the Internet. The Geography Redundancy Group advertises routes, which is a second notification, to connect a call from a mobile station (mobile device) to an external system in warm-manual, hot-auto, and hot-manual mode by switching to a second DMAG (SGW/PGW) for connecting the call. Exhibit 40 at 6-3.[31] It performs a switchover to a second DMA node of the plurality of DMA nodes, "the standby node," to take over service from the previously active node (the first DMA

[31] Exhibit 25 is a manual for Mobile Content Cloud, which provides virtualized EPC (vEPC) functionalities. Exhibit 25 at 1-2 ("The Affirmed Networks Mobile Content Cloud is a virtualized EPC (vEPC) . . . solution"). As discussed above, Defendants previously marketed their mobile core software as vEPC, and now market it as Affirmed Mobile Core and Affirmed Mobile Content Cloud. Exhibit 13 (Affirmed Intel vEPC Performance Report.pdf) at 1, 2 ("Affirmed Mobile Content Cloud (MCC) . . . offers . . . vEPC functionality" and describing tests of Affirmed Mobile Core as testing of Affirmed vEPC). As shown in the manual, the Affirmed Mobile Core software (referred to as Mobile Content Cloud) is 3GPP compliant. Exhibit 25 at 1-16. This includes providing SGSN, MME, GGSN, SGW and PGW functionality to support network services in 2G, 3G, 4G, LTE, and VoLTE mobile networks. *Id.*; Exhibit 46 (3GPP.pdf) at 1 (3GPP specifications cover cellular telecommunications technologies).

node), which is configured to connect a call from a mobile device through the first DMAG (SGW/PGW). Exhibit 25 at 6-4.

321. RADIUS transmits the request (the second notification) to another active peer (the second DMA node) from RADIUS server group and moves "the non-responsive peer from a pending state to an *inactive* state." *Id*. at 9-23. The non-responsive peer node is the first DMA node, which is configured to connect the call to the mobile device through the first DMAG (SGW/PGW). The RADIUS client uses a round-robin approach to select the second DMA node within the group and "retransmits the request" to connect calls from the mobile device to the external system via the second DMAG (SGW/PGW). *Id*. at 9-22.

322. **The second notification indicates that the second DMAG has taken over the operations from the first DMAG and instructs the DMA node to connect calls from the mobile station to the external system via the second DMAG**: The Geography Redundancy Group sends routes, which is a second notification, to indicate that the second DMAG (SGW/PGW) has taken over the operation from the first DMAG (SGW/PGW) to an external system in warm-manual, hot-auto, and hot-manual mode. Exhibit 40 at 6-3. RADIUS sends the request (the second notification) to the DMA node that indicates the second DMAG (SGW/PGW) has taken over the operation from the first DMAG (SGW/PGW). The second DMA node is the active ASE server or virtual machine node that hosts the second DMAG (SGW/PGW). The second notification instructs the first DMA node to connect calls from the mobile station (mobile device) to an external system (e.g., internet) through the second DMA node connecting to the second DMAG (SGW/PGW).

323. **Sending a third notification from the DMAG management system to the external system to instruct the external system to connect subsequent calls to the mobile**

station via the second DMAG: The DMAG management system sends a third notification to instruct the external system (e.g., the IP Multimedia Subsystem ("IMS")) to connect subsequent calls to the mobile station (mobile device) via the second DMAG (SGW/PGW).

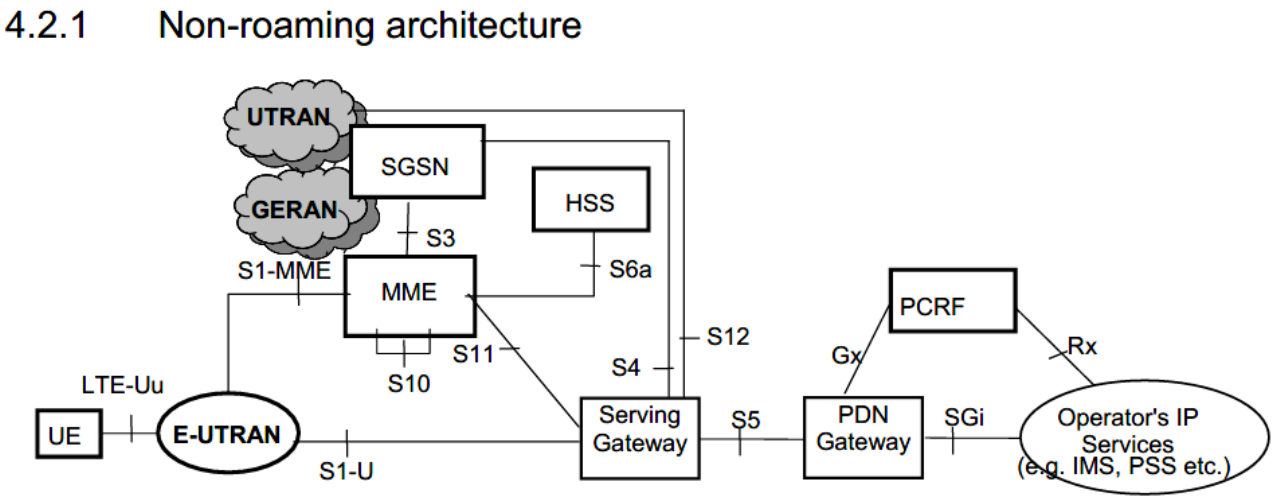

Figure 4.2.1-1: Non-roaming architecture for 3GPP accesses

Exhibit 41 (3GPP_TS_23.401.pdf) at 16[32] (showing the PGW's connection to the external system from the mobile operators including the IMS); Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 1, 3 (vEPC, which is Affirmed Mobile Core, supports 3GPP compliant open architecture including SGSN, MME, GGSN, SGW, and PGW). The PGW/SGW (the second DMAG) supports the IMS-based system in LTE (4G) by creating a dedicated transmission channel (bearer) for IMS-based voice. Exhibit 25 at xxvii.

324. The secondary node in Geography Redundancy Group (the DMAG management system), when active, advertises lower-cost routes, which is the third notification.

[32] Exhibit 41 (3GPP_TS_23.401.pdf) describes the 3GPP standard, including its functionality for roaming and non-roaming scenarios and covers mobility between 3GPP radio access technologies, policy control, charging, and authentication. Exhibit 41 (3GPP_TS_23.401.pdf) at 10-11. Affirmed Mobile Core is 3GPP complaint, meaning that it provides the functionality described in the 3GPP standard. Exhibit 15 (Virtual Evolved Packet Core (vEPC) Solution.pdf) at 3 (describing its 3GPP compliance).

The low-cost routes include connections from the external system to another network entity (a second DMAG) depending on the nature of the network outage. Exhibit 25 at 6-3. For example, in the hot-auto redundancy group, the primary node "fails over to standby and the secondary node fails over to active." *Id.* at 6-4. An automatic failback can occur "from the secondary active node to the primary active node under similar circumstances (network fault or secondary node failure)." *Id.* The third notification (low-cost routes) will instruct the external system to connect subsequent calls to the mobile device via the second DAMG (fail-over node), which is SGW/PGW.

325. The session-aware peer selection in RADIUS (the DMAG management system) sends all RADIUS Accounting requests (the third notification) for "a given session to the same RADIUS server peer." Exhibit 25 at 9-21. If a peer became unavailable, the system transmits, in a round-robin fashion, the subsequent "RADIUS Accounting messages" (the third notification) to other active peers in the same RADIUS Accounting server group. *Id.*

> Use the following command to enable this feature at the RADIUS Accounting server group level:
>
> **service-construct interface aaa-interface-group radius-client server-group <radius-acct-server-group-name> session-aware-peer-selection true**
>
> *True* – All RADIUS Accounting requests for a given session are sent to the same RADIUS server peer.
>
> *False* – RADIUS Accounting requests for a given session are sent to RADIUS server peers selected in a round robin fashion.

Id. (enabling of the session aware peer selection to send the third notification to the external system). The third notification (RADIUS accounting messages) will instruct the external system (e.g., the Internet) to connect the subsequent calls to the second DMAG (SGW/PGW), which is another active peer in the RADIUS Accounting server group.

326. Defendants' infringement of the '931 Patent has injured and continue to injure Lemko in an amount to be proven at trial, but not less than a reasonable royalty. Defendants' infringement has caused and is continuing to cause irreparable injury to Lemko, and Lemko will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by this Court.

327. Pursuant to 35 U.S.C. §§ 283, 284, and 285, Lemko is entitled to injunctive relief, damages, and attorney's fees and costs.

COUNT XVI
(Indirect Infringement of the '931 Patent)

328. Lemko repeats, realleges, and incorporates by reference, as if fully set forth herein, the allegations of the preceding paragraphs.

329. Defendants' customers directly infringe the '931 Patent when they use or assemble Affirmed Mobile Core as an operating network, for example by installing the Affirmed Mobile Core software on servers and connecting those servers to BTSs, thereby making an infringing network. Defendants have induced and contributed to their customers' direct infringement of the '931 Patent under 35 U.S.C. § 271(b) by instructing and encouraging their customers infringing use and making of Affirmed Mobile Core as a system infringing at least exemplary Claim 1.

330. Defendants know about the '931 Patent and that APNS infringes the '931 Patent, at least from their receipt of Lemko's February 14, 2022 Complaint and December 20, 2022 Preliminary Infringement Contentions, and October 19, 2023 First Amended Complaint.

331. Lemko's Complaint specifically identifies the Asserted Patents and the Accused Products, states that Defendants are infringing, and explains Defendants' infringement of the '931 Patent. Doc. 1 at ¶¶ 281-316.

332. Lemko's First Amended Complaint specifically identifies the Asserted Patents and the Accused Products, states that Defendants are infringing, and explains Defendants' infringement of the '931 Patent. Doc. 59 at ¶¶ 259-284.

333. Appx. H-1 to Lemko's Preliminary Infringement Contentions, Exhibit 39 hereto, provides a detailed disclosure of Defendants' infringement of the '931 Patent.

334. This Second Amended Complaint further places Defendants on specific notice that they are infringing and contributing to and inducing customers' infringement of the '931 Patent.

335. Defendants knowingly and actively aided and abetted their customers' direct infringement of the '931 Patent. As discussed above, Affirmed Mobile Core infringes the '931 Patent by providing SGW, PGW, and RADIUS functionality. Defendants instruct and encourage their customers on how to use each of these important features of Affirmed Mobile Core, including through trainings, reference materials, user manuals, user guides, promotional materials, and by providing customer support, which are all intended to enable and encourage customers' purchase, installation, and use of Affirmed Mobile Core, including its SGW, PGW, and RADIUS functionality. For example, Defendants publish a variety of product documents that that describe functionality of Affirmed Mobile Core. *See, e.g.*, Exhibit 31, (https://www.affirmednetworks.com/asset-type/white-papers/) (listing Affirmed Networks white papers). Defendants also provide product blog posts that cover Affirmed Mobile Core's infringing features and instruct customers on how to configure and use Affirmed Mobile Core. *See, e.g.,* Exhibit 32 (https://www.affirmednetworks.com/blog/) (listing Affirmed Networks blog posts, including on vEPC, which is now Affirmed Mobile Core).

336. In addition, Defendants support customers' use and configuration of Affirmed Mobile Core through a dedicated support center. Exhibit 33 (https://www.affirmednetworks.com/support/) ("Affirmed Networks' 24/7/365 global support team ensures rapid response times to assist communication service providers (CSPs) no matter where they are in their virtualization journey, from initial network design to system integration and post-production support, for 2G, 3G, 4G, and 5G networks.").

337. In addition, Defendants operate an online site called "Azure Community Support," with discussions and articles covering the use of ASE servers, which are used with Affirmed Mobile Core in an infringing manner (as described above). Exhibit 42 (https://azure.microsoft.com/en-us/support/community/). Azure Community Support provides in-depth instructions for installing and configuring ASE servers.

338. Defendants are also liable for contributory infringement of the '931 Patent pursuant to 35 U.S.C. § 271(c) by knowing or being willfully blind to the fact that they are contributing to their customers' infringement of at least exemplary Claim 1 by offering to sell and selling Affirmed Mobile Core in the United States. The Affirmed Mobile Core software that Defendants provide is, at a minimum, a material component of the system that infringes Claim 1 of the '931 Patent.

339. Affirmed Mobile Core is not a staple article or commodity of commerce suitable for substantial noninfringing use. The function of Affirmed Mobile Core is to provide the accused mobile networks, which infringe when they operate as described above for Count I, and they have no purpose other than to be use to provide the accused mobile networks. Defendants therefore know or are willfully blind to the fact that they are contributing to their customers' infringement of the '931 Patent, including Claim 1.

340. Defendants' indirect infringement of the '931 Patent has injured and continues to injure Lemko in an amount to be proven at trial, but not less than a reasonable royalty. Lemko will continue to suffer damage and irreparable injury unless and until that infringement is enjoined by the Court.

341. Pursuant to 35 U.S.C. §§ 283, 284, and 285, Lemko is entitled to injunctive relief, damages, and attorney's fees and costs.

PRAYER FOR RELIEF

WHEREFORE, Lemko prays for judgment and relief as follows:

A. An entry of judgment holding that Defendants have infringed and are infringing the '763, '414, '988, '409, '111, '980, '478, and '931 Patents; and have induced infringement and are inducing infringement of the '763, '414, '988, '409, '111, '980, '478, and '931 Patents; and have contributed and continue to contribute to infringement of the '763, '414, '988, '409, '111, '980, '478, and '931 Patents;

B. A preliminary and permanent injunction against Defendants and their officers, employees, agents, servants, attorneys, instrumentalities, and/or those in privity with them, from infringing, inducing infringement, and contributing to infringement of the '763, '414, '988, '409, '111, '980, '478, and '931 Patents and for all further and proper injunctive relief pursuant to 35 U.S.C. § 283;

C. An award to Lemko of such damages as it shall prove at trial against Defendants that is adequate to fully compensate Lemko for Defendants' infringement of the '763, '414, '988, '409, '111, '980, '478, and '931 Patents, said damages to be no less than a reasonable royalty;

D. An award to Lemko of enhanced damages under 35 U.S.C. § 284;

E. A finding that this case is "exceptional" and an award to Lemko of its costs and reasonable attorneys' fees, as provided by 35 U.S.C. § 285;

F. An accounting of all infringing sales and revenues, together with post judgment interest and prejudgment interest from the first date of infringement of the '763, '414, '988, '409, '111, '980, '478, and '931 Patents; and

G. Such further and other relief as the Court may deem proper and just.

Respectfully submitted,

Dated: September 6, 2024

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DEMAND FOR JURY TRIAL

Lemko demands a jury trial on all issues so triable.

Respectfully submitted,

Dated: September 6, 2024

s/ Jon B. Hyland

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CERTIFICATE OF SERVICE

The undersigned certifies that counsel of record who are deemed to have consented to electronic service are served with a copy of this document via the Court's CM/ECF System on September 6, 2024.

s/ Jon. B. Hyland
Jon B. Hyland