

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CISCO SYSTEMS, INC.,

Petitioner,

v.

OPTIMNET LLC,

Patent Owner

IPR2026-00320
U.S. Patent No. 8,780,887

**DECLARATION OF DR. MAHDI ESLAMIMEHR IN SUPPORT OF
PATENT OWNER'S PRELIMINARY RESPONSE**

I, Dr. Mahdi Eslamimehr, declare as follows:

I. Introduction and Qualifications

1. I have been retained by counsel for OptimNet LLC ("Patent Owner") to provide independent technical opinions in connection with the Patent Owner Preliminary Response concerning U.S. Patent No. 8,780,887 (the "'887 patent"). The bases for my opinions, including my education, training, and professional experience, are summarized below and set forth in greater detail in my curriculum vitae, attached as **Ex. 2002**.

2. I am an expert in computer networking and in the design, development, and operation of large-scale network infrastructure, virtual networks, and network connectivity software. My areas of expertise include network virtualization and overlay networks; IP tunneling and encapsulation; network address translation (NAT) and firewall traversal; peer-to-peer (P2P) and end-to-end direct communication; virtual and overlay addressing across IPv4 and IPv6; network mobility; and the operation support and business support systems (OSS/BSS) used to provision and manage carrier-grade fixed and mobile networks. These fields are at the core of the '887 patent, which is directed to network-based communication in a virtual network environment in which virtual tunnel routers establish IP-over-IP tunnels, coordinated by a tunnel mapping controller and using virtual network prefix

information, to enable direct communication between terminals that would otherwise be separated by NATs or firewalls, while supporting mobility based on a virtual IP.

3. I hold a Doctor of Philosophy (Ph.D.) in Computer Science from the University of California, Los Angeles (UCLA), and a Master of Science (M.S.) in Computer Science from Linköping University, Sweden. I also hold a Master of Business Administration (MBA) from the London School of Economics and Political Science, and I completed executive education in Strategy Execution at Harvard Business School. I am currently an Adjunct Professor in the Department of Computer Science at the University of Southern California (USC).

4. I have worked as a software and telecommunications engineer for more than twenty years, with responsibilities spanning the design, development, analysis, testing, and operation of network protocols, network connectivity solutions, and the systems used to manage virtualized and private networks at scale. As the Chief Technology Officer and Chief Operating Officer of Clarity Global, a network-solutions company specializing in operation and business support systems for mid-to large-scale telecommunications operators, I designed, developed, and oversaw the operation of network management and connectivity solutions for fixed (FTTx) and mobile (2G/3G/4G/LTE/5G) operators, data centers, and energy companies. My responsibilities included the design of platforms spanning SDN, NFV, virtualized

RAN, and IP/transport domains, and the roll-out and operation of network solutions serving carriers with more than 500 million subscribers across data, IP, transmission, voice, IMS, and broadband networks. This work required me to design, deploy, and operate the classes of network elements related to the technology of the '887 patent—routers, gateways, tunnel endpoints, and the controllers and signaling that coordinate connectivity—across heterogeneous IPv4 and IPv6 networks and across access networks including Ethernet, WiFi, and mobile networks.

5. Through my engineering and executive roles, I developed deep familiarity with the foundational technologies and prior art underlying the '887 patent. This includes IP-in-IP and IP-over-UDP/TCP tunneling and encapsulation; overlay and virtual networks layered on the public Internet; the assignment and management of network prefixes and virtual addresses to devices on such networks; and the well-known difficulties of establishing direct, end-to-end communication when endpoints sit behind a NAT or firewall. It further includes standardized NAT-traversal techniques, including the Session Traversal Utilities for NAT (STUN) procedure referenced in the patent and related industry techniques such as Traversal Using Relays around NAT (TURN) and Interactive Connectivity Establishment (ICE); UDP and TCP "hole punching" used to open paths between peers behind NATs; the determination of network connection types and NAT behaviors (for example, full-cone, restricted-cone, port-restricted-cone, and symmetric NAT) that

govern whether direct communication is possible; the use of a server, relay, or rendezvous element to exchange mapped IP/port information and to relay traffic when direct paths cannot be established; and the use of stable virtual or overlay identifiers to provide host mobility independently of the changing network-assigned IP address, and the associated network-based mobility problem. I was working with these tunneling, virtual-network, NAT-traversal, and mobility technologies in my professional capacity during and before the relevant time frame of the '887 patent.

6. Earlier in my career, I was responsible for the analysis, design, and implementation of network-protocol software and model-based testing frameworks at Ericsson AB's research and development group in Stockholm, Sweden, work that required extensive study of how network protocols are deployed at large scale. I also developed Network-on-Chip (NoC) supporting software and a scalable topology language for many-core processors at Samsung Electronics' infrastructure research and development group, implemented worst-case-execution-time and scheduling tools for microcontrollers at VERIMAG (CNRS) in France, and migrated legacy databases for the United Nations World Food Program. I subsequently served as a postdoctoral scholar at UCLA and SAP Labs, where I conducted research into complex, large-scale software analysis, testing, and formal verification.

7. In addition to my engineering and operational experience, I have provided technology and intellectual-property consulting to venture capital firms,

private equity firms, and Fortune 100 companies. I have led or supervised more than forty technical due diligence and merger-and-acquisition engagements, a number of which concerned virtualized and private network infrastructure, including SD-WAN and MPLS networks, telecommunications network core infrastructure, 5G networks, enterprise connectivity, and cloud and data-center infrastructure. I have also performed patent valuation and analysis directed specifically to virtual private network (VPN), content delivery network (CDN), machine-to-machine (M2M), and edge/fog computing technologies.

8. My research has been published and presented at leading peer-reviewed conferences and journals and has been cited more than 219 times. I received the Best Paper award from the IEEE International Symposium on Software Reliability Engineering (ISSRE), a software-engineering conference sponsored and hosted by the National Institute of Standards and Technology (NIST).

9. I have been retained as a testifying expert witness and as a non-testifying expert consultant in more than 120 matters, identified in my curriculum vitae, involving patents, trade secrets, software copyright, breach of contract, and related technical disputes in state and federal courts and in arbitration proceedings. I have never been disqualified as an expert witness in any legal proceeding.

10. Quandary Peak Research is reimbursed for my work in this matter at the rate of \$650 per hour, plus reimbursement for direct expenses. My compensation

is based solely on the time I devote to this matter and is not contingent in any way on the substance of my opinions or the outcome of this proceeding.

II. Materials Considered and Methodology

11. In forming my opinions, I reviewed at least the following materials: the '887 patent, Ex. 1001; the prosecution history, Ex. 1002; the Petition; the Declaration of Dr. A.L. Narasimha Reddy, Ex. 1003; Pankratov, Ex. 1004; the other exhibits attached to or cited in the Petition; and the Patent Owner Preliminary Response. I also considered these materials in light of my education, training, and professional experience in computer networking, virtual networks, tunneling, NAT traversal, and related network-management technologies.

12. I understand that, for purposes of the Preliminary Response, Patent Owner applies Petitioner's proposed level of ordinary skill in the art. My opinions would be the same under that proposed level.

13. I have applied the plain and ordinary meaning of the claim terms as they would have been understood by a person of ordinary skill in the art in light of the specification and prosecution history of the '887 patent. I have not been asked to offer a separate claim construction opinion for purposes of this declaration.

14. My opinions are based on my review of these materials, my education and experience, and my understanding of how a person of ordinary skill in the art

would have understood the relevant disclosures as of the priority date of the '887 patent.

15. My analysis compared the claim language and the Petition's specific citations to Pankratov. I did not assume that a claim limitation is satisfied merely because Pankratov generally relates to VPNs, tunneling, or NAT traversal. Rather, I considered whether the cited portions of Pankratov disclose the particular information, timing, and data flows relied on in the Petition.

16. I have been asked to evaluate certain technical issues raised by the Petition's mapping of Pankratov to independent claims 1 and 6 of the '887 patent. My opinions below focus on the technical distinction between virtual-network addressing information and external NAT endpoint information, and on whether the portions of Pankratov cited by the Petition show the claimed tunnel establishment and direct communication limitations under the Petition's own mapping.

III. Technical Background of the '887 Patent

17. In network systems involving virtual networks and tunneling, a person of ordinary skill in the art would have distinguished between virtual-network addressing information and external transport endpoint information.

18. Virtual-network addressing information identifies addresses, address ranges, or prefixes used inside a virtual network. For example, a virtual IP address or subnet may identify a host, endpoint, or destination as it appears within the virtual

network. Such information is commonly used by a virtual adapter, virtual interface, or routing function to determine where a packet is logically addressed within the virtual network.

19. External transport endpoint information serves a different technical purpose. An external IP address and port identifies where packets must be sent on the underlying physical or public network, including after translation by a NAT device. In a NAT traversal system, external IP/port information is used so that one endpoint can send packets to another endpoint through the NAT/firewall environment.

20. These two categories of information are not interchangeable. A virtual IP address or subnet may identify a destination within a virtual network, while an external IP/port pair identifies the underlay transport endpoint that can be reached across the public network or through a NAT. A system may use both categories of information, but using one does not necessarily mean that the system uses the other for the same step.

21. In particular, using a target's virtual IP address when sending a packet through an already-created tunnel is technically different from using an external IP address and port to create, activate, or confirm the tunnel in the first instance. The former concerns addressing and forwarding within the virtual network; the latter concerns NAT traversal and peer-to-peer reachability on the underlying network.

22. The '887 patent describes communication in a virtual network environment using virtual tunnel routers and a tunnel mapping controller. The claims recite virtual tunnel routers receiving or requesting virtual network prefix information from a tunnel mapping controller and then establishing or creating a tunnel for direct communication.

23. The '887 patent describes virtual network prefix information as addressing information for terminals or devices connected to respective virtual networks. See Ex. 1001, 6:44-58. The patent also separately discusses information such as mapped IP/port, network connection type, and operation mode used for hole punching. See Ex. 1001, 8:1-25. A person of ordinary skill in the art would understand these to be different types of information serving different roles.

24. Claim 1 requires, among other things, that if the first virtual tunnel router has received a hole punching message, the first virtual tunnel router establishes a tunnel with the second virtual tunnel router “based on the virtual network prefix information.” Claim 6 similarly requires direct communication between the first and second virtual tunnel routers “by linking the virtual network prefix information” received by the respective virtual tunnel routers.

IV. Pankratov

25. Pankratov concerns server-mediated setup and maintenance of peer-to-peer client computer communications. Pankratov describes a mediation server that

performs discovery, prediction, and confirmation steps to facilitate peer-to-peer communication between client computers behind NAT devices or firewalls.

26. In the portions cited by the Petition for tunnel activation, Pankratov uses external IP/port information. Pankratov describes providing client computers with each other's confirmed external IP/port addresses so that they may begin exchanging data through the tunnel. See Ex. 1004 ¶¶ [0067]-[0069].

27. Pankratov also describes virtual IP addresses, subnets, and virtual network adapters in the context of VPN network configuration and packet forwarding. See, e.g., Ex. 1004 ¶¶ [0108], [0110]-[0111], [0114]-[0116]. Those disclosures concern virtual-network addressing and the handling of packets by a virtual network adapter. They do not themselves describe the ANFT tunnel-activation step by which Pankratov's clients are instructed to contact each other using confirmed external IP/port addresses.

28. A person of ordinary skill in the art would therefore understand Pankratov as using different information for different purposes: virtual IP/subnet information for virtual-network configuration and addressing, and external IP/port information for NAT traversal and peer-to-peer tunnel activation.

V. Technical Opinions Regarding Claim 1

29. I understand that the Petition maps the claimed "virtual network prefix information" to Pankratov's "virtual IP address and a non-trivial subnet." See Pet.

16. I also understand that, for limitation [1.3], the Petition maintains this mapping and relies on Pankratov's client computers as the claimed virtual tunnel routers.

30. Under that mapping, the Petition must show that Pankratov's first client computer establishes a tunnel with the second client computer based on the virtual IP address and non-trivial subnet information that the Petition identifies as the claimed virtual network prefix information.

31. In my opinion, the Petition does not make that showing. The portions of Pankratov cited by the Petition for activating the tunnel describe the clients being provided with each other's confirmed external IP/port addresses and then starting to exchange data through the tunnel. See Ex. 1004 ¶ [0069]. That is external NAT endpoint information, not the virtual IP address and subnet information that the Petition identifies as the claimed virtual network prefix information.

32. Technically, this distinction matters. In Pankratov, the confirmed external IP/port address information identifies how one client can reach the other through the underlying network and any NAT devices. The virtual IP/subnet information identifies addressing within the virtual network. A person of ordinary skill in the art would not treat Pankratov's use of external IP/port information to activate a peer-to-peer communication path as the same as establishing a tunnel based on virtual-network prefix information.

33. The Petition also relies on Pankratov’s discovery process, in which the server learns mappings and determines which clients require tunnels. But that does not show that the client computer establishes the tunnel based on virtual IP/subnet information. From the client’s perspective, the Petition identifies the later confirmation or activation step as the step where the clients are instructed to communicate. In that step, Pankratov uses external IP/port information.

34. Nor do Pankratov’s virtual network adapter disclosures cure this issue. The cited virtual adapter passages describe configuring a virtual adapter with a virtual IP address/subnet and using virtual IP addresses when packets are sent through a tunnel. See Ex. 1004 ¶¶ [0110]-[0111], [0114]. In my opinion, those disclosures relate to virtual-network addressing and packet forwarding, not to the tunnel-activation process identified by the Petition for limitation [1.3].

35. Dr. Reddy states that “a POSITA would have understood that tunnels are established between clients based on the virtual network prefix information.” Ex. 1003 ¶ 69. In my opinion, that statement does not provide a technical explanation connecting the virtual adapter disclosures to the step of establishing or activating the tunnel. The cited virtual adapter disclosures show how virtual-network packets may be addressed or forwarded once virtual addressing is configured. They do not show that Pankratov’s client establishes the peer-to-peer tunnel based on the virtual IP

address and subnet rather than the external IP/port information used in the cited confirmation step.

36. For these reasons, under the Petition’s own mapping, Pankratov does not teach that the first client computer establishes a tunnel with the second client computer based on the virtual IP address and non-trivial subnet information that the Petition identifies as the claimed virtual network prefix information.

VI. Technical Opinions Regarding Claim 6

37. Claim 6 requires, among other things, “performing direct communication between the first virtual tunnel router and the second virtual tunnel router by linking the virtual network prefix information received by the first virtual tunnel router and the second virtual tunnel router, respectively.”

38. I understand that the Petition again maps the claimed virtual network prefix information to Pankratov’s virtual IP address and subnet information. I also understand that, for limitation [6.4], the Petition relies on Pankratov’s disclosure that the mediation server provides computer A and computer B with each other’s IP address and port, and that the IP address and port of the two computers are linked to form a tunnel. See Pet. 34-35; Ex. 1004, Claim 1.

39. In my opinion, this does not show direct communication “by linking the virtual network prefix information” under the Petition’s mapping. The Petition’s cited mechanism links or uses external IP address and port information. External

IP/port information is not the same as the virtual IP address and subnet information that the Petition identifies as the claimed virtual network prefix information.

40. A person of ordinary skill in the art would understand the difference. Linking external IP/port endpoints is a NAT traversal or transport-layer reachability operation. Linking virtual network prefix information would involve virtual-network addressing or prefix information, not merely NAT-translated transport endpoints. A disclosure that two clients communicate using each other's external IP address and port does not, without more, disclose that direct communication is performed by linking the respective virtual IP/subnet information received by the two clients.

41. The Petition's statement that the virtual IP address and subnet "were linked to a specific tunnel associated with the subnet" does not change my opinion. That statement does not explain what performs the alleged linking, what information is linked, or how that alleged linking causes direct communication between the two client computers. It also does not identify a disclosure in Pankratov in which the clients perform direct communication by linking their respective virtual IP/subnet information. At most, the cited Pankratov passages describe virtual adapter configuration and packet forwarding using virtual IP addresses.

42. Dr. Reddy's analysis does not supply the missing technical explanation. The Reddy Declaration repeats the same general assertion that virtual IP address and subnet information is linked to a tunnel, but it does not explain how Pankratov's

clients perform direct communication by linking the respective virtual network prefix information, as opposed to using external IP/port information to establish and use the peer-to-peer path.

43. For these reasons, under the Petition's own mapping, Pankratov does not teach performing direct communication between the first and second client computers by linking the virtual IP address and subnet information that the Petition identifies as the claimed virtual network prefix information.

44. My opinions are based on the technical disclosures of the '887 patent, Pankratov, the prosecution history, and the Petition's specific mappings. I am not offering legal conclusions regarding institution or obviousness; I understand those determinations are for the Board.

VII. Summary of Opinions

45. My opinions are limited to the technical issues discussed above. I have not attempted to address every limitation of claims 1-10. Rather, I have focused on the limitations identified above because they are sufficient to explain the technical deficiencies in the Petition's mapping of Pankratov to independent claims 1 and 6.

46. In summary, the Petition maps the claimed virtual network prefix information to Pankratov's virtual IP address and subnet information. But for the disputed tunnel-establishment and direct-communication limitations, the Petition relies on Pankratov's external IP/port information. In my opinion, a person of

ordinary skill in the art would not understand these two categories of information to be the same or interchangeable. Pankratov's external IP/port information is used for NAT traversal and peer-to-peer reachability, while its virtual IP/subnet information is used for virtual-network addressing and packet forwarding.

47. Because the Petition does not bridge that technical gap, in my technical opinion, the cited portions of Pankratov do not teach limitation [1.3] of claim 1 or limitation [6.4] of claim 6 under the Petition's own mapping.

48. My opinions are based on the materials I have reviewed to date and on my education, training, and professional experience.

49. I reserve the right to supplement or amend my opinions if additional materials, arguments, or evidence become available.

50. I further declare that all statements made herein of my own knowledge are true, that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001. I declare under penalty of perjury that the foregoing is true and correct.

51. Executed on July 2, 2026, at Los Angeles, California.



Mahdi Eslamimehr, Ph.D.