EXHIBIT 27

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
AUSTIN DIVISION

CONCURRENT VENTURES, LLC AND XTREAMEDGE, INC., Plaintiffs, v. ADVANCED MICRO DEVICES, INC. AND PENSANDO SYSTEMS, INC., Defendants.	Civil Action No. 1:24-cv-335-ADA

Declaration of Kevin Jeffay Regarding U.S. Patent No. 10,944,634

I, Kevin Jeffay, declare as follows:

I. Introduction

1. My name is Kevin Jeffay. I have been retained on behalf of defendants Advanced Micro Devices, Inc. and Pensando Systems, Inc. to offer my opinion on claim construction issues relating to U.S. Patent No. 10,944,634 ("the '634 patent"). I am being compensated at a rate of $800 per hour for my time spent working on this case. My compensation is not affected by the outcome of this case.

II. Qualifications

2. I am a full professor in the Department of Computer Science at the University of North Carolina at Chapel Hill (UNC), where I hold the position of Gillian T. Cell Distinguished Professor of Computer Science. I have been a faculty member at UNC since 1989 and from 2014–2022, and again in 2024, I served as the Chairman of the Department. I received a Ph.D. in computer science from the University of Washington in 1989. Before that, I received a M.S. degree in computer science from the University of Toronto in 1984, and a B.S. degree with Highest Distinction in mathematics from the University of Illinois at Urbana-Champaign in 1982. I have been involved in the research and development of networked computing systems for over 40 years. My qualifications are further set out in my curriculum vitae, which is attached to this declaration.

III. Level of Ordinary Skill in the Art

3. It is my opinion that the field of the '634 patent is networking and telecommunications. A person of ordinary skill in the field of art of the '634 patent would have been a person with a bachelor's degree in electrical engineering, computer science, computer engineering, or a similar field with at least two years of experience in networking and

telecommunications or a person with a master's degree in electrical engineering, computer science, computer engineering, or a similar field with a specialization in networking and telecommunications. A person with less education but more relevant practical experience may also meet this standard.

IV. Overview of the '634 Patent

4. The '634 patent is titled "Optimization for network connections." According to the Background, a "network connection between two endpoints starts off without knowledge of the performance of the connection and the effect of bandwidth realized between the peers." '634 pat., 1:7–9. "The protocol stack builds up this knowledge over time via various algorithms." *Id.*, 1:10–11. These algorithms may "induce considerable time loss in order to average out to the effect of bandwidth, and may take many seconds or even minutes to reach full effective bandwidth capacity" or may be "compute intensive and more difficult to implement." *Id.*, 1:11–14 & 1:17–18. The '634 patent purports to address these issues. Specifically, claim 1 recites collecting "parameter values for determination of bandwidth of network connections," determining at a tuner server that a next network connection "matches a geographical area" of a past network connection, and initiating the next network connection "based on the determination at the tuner server, with a transmission bandwidth based on the parameter values for the past network connection." *Id.*, 14:1–13. Claims 8 and 15, the other independent claims, are similar except they recite a "tangible, non-transitory, computer-readable media" and "network connected device," respectively. *Id.*, 14:51 & 15:40.

V. "geographical area"

5. I understand that Plaintiffs contend an IP address is equivalent to a geographical area. It is my opinion that an IP address is not equivalent to a geographical area. An IP address

is an identifier for a device on a network (more specifically, an identifier of a network interface on a device). Technically, an IP address is either a 32-bit number (for IP version 4 addresses) or a 128-bit number (for IP version 6 addresses).[1] In the case of IPv4 addresses, the address is just a number somewhere in the range of 0 to approximately 4 billion. There is no inherent meaning to the numeric value of an IP address and as such, IP addresses are most commonly written using the easier to remember "dotted decimal" notation wherein each octet of the address (each sequence of 8-bits) is expressed as a decimal number and the IP address is written as octet1-value.octet2-value.octet3-value.octet4-value. For example, the value of the IP address of my computer is 2,550,301,650 (10011000000000101000001111010010 in binary)—a difficult to remember number. Written in dotted decimal notation, the address is 152.2.131.210.

6. An IP address, like a URL (a "web address"), does not represent a physical place, either literally or intrinsically. As such, the physical place of a device cannot be reliably derived from its IP address. For example, organizations that are on the Internet are assigned a range of IP addresses for their devices to use. Individual devices are typically assigned a temporary IP address from within the organization's range using the well-known Dynamic Host Configuration Protocol, or DHCP. A device is "leased" an address for a period of time at the end of which the address is "returned" to the DHCP server for allocation to another device at possibly a different location (and possibly reallocated to the same device). Thus, in most cases, an IP address cannot uniquely identify the location of a device because the address may be assigned to different devices (at different locations) at different points in time.

7. For organizations that are not "on" the Internet, meaning the organization has not been assigned a range of IP addresses, the devices in the organization (*e.g.*, user's computers)

[1] Note that there is no version 5 of IP.

can use a "private" IP address from an address range reserved for this purpose such as 192.168.0.0/16 or 10.0.0.0/8 (with the specific address being assigned by a DHCP server as described above). Private IP addresses in these ranges are "non-routable" addresses, meaning machines with these addresses cannot directly access computers outside their organization (*e.g.*, they cannot directly access computers on the Internet) and similarly cannot be directly accessed by computers outside their organization. To access the Internet, a router performing network address translation, or "NAT," must be present on the organization's network. This NAT router will typically be the router that connects the organization to its "upstream" Internet Service Provider (ISP) through which the Internet can be accessed. The NAT router will have a "public" (routable) IP address assigned by the ISP (meaning the router can directly access computers on the Internet as well as be accessed directly by computers on the Internet). When machines within the organization (*e.g.*, user's computer's) using private IP addresses desire to communicate with computers outside the organization (*e.g.*, with computers on the Internet), they send their requests to the NAT router which sends the request to the intended destination on behalf of the requesting machine in the organization. In so doing, the actual request that is sent to a computer on the Internet carries the (public) IP address of the NAT router and not the (private) IP address of the originally requesting computer (because as a literal matter, it is the NAT router that is sending the request to the computer on the Internet and not a user's computer). Thus, when requests "from" a machine within an organization using private IP addresses are seen on the Internet, these requests will all carry the IP address of the NAT router and thus cannot identify the actual machine that originated the request, let alone the location of that machine.

8. The notion of network address translation can be and is applied hierarchically meaning that addresses may be translated multiple times as requests attempt to make it out to the Internet. For example, "carrier-grade network address translation" ("CGNAT") is an example of a second layer of address translation used by major ISPs. With CGNAT, requests from machines in a network using private IP addresses may undergo a first address translation at their local NAT router and then a second (or more) level of address translation within that organization's or user's ISP's network. That is, the NAT router connecting a network using private IP addresses to its upstream ISP may itself be using a private address that is translated to a public address by a further router within the ISP's network. CGNAT can provide a large geographic scope of address translation meaning that once out on the Internet, requests from an ISP's customers in, say, Atlanta may carry the same IP address as the ISP's customers in Washington D.C.

9. Another scenario wherein there is no correlation between an IP address and the location of a machine using that IP address occurs when virtual private networks (VPNs) are used. The typical use case for a VPN occurs when a user within an organization is physically away from the organization but desires their computer to be "on" their organization's local network. To achieve this, the remote user would establish a VPN between their computer and a server within their organization's local network. The VPN is comprised of a network "tunnel" established between the aforementioned two devices. The remote user's computer is allocated an IP address within the range assigned to their organization (in addition to whatever public or private IP address the computer was previously using). Applications running on the remote user's computers generate network requests to computers within their organization using this assigned address. The individual packets of the request are routed from the remote user's computer to their organization by being encapsulated within a new packet that is sent

("tunneled") from the remote user's computer to the organization's VPN server. When the encapsulated packets reach the VPN server, they are decapsulated and transmitted on the organization's local network to their destination within the organization.

10. The result of using a VPN is that on the organization's network, the requests originating at the remote user's computer appear to have been generated on the local network when in fact they could be coming from literally any location in the world (via a VPN from that location to the organization). Moreover, there is no way to tell if any given request that appears to be local to a network actually originated on that network or came into that network via a VPN. That is, when examining packets/requests on a network, one typically cannot tell if the packet/request transited via a VPN or not. For this additional reason, the actual physical location of a device cannot be reliably determined from its IP address.

11. As a further example, the IP address can be "spoofed," *i.e.*, modified to hide the identity of the sender.

12. I reviewed the prosecution history of the '634 patent and understand that the examiner cited to Cole as a prior-art reference. CV-AMD0000066–68. Cole discloses a connection manager that is operable to manage connections in Internet Protocol (IP) networks. For example, Cole discloses a user communicating with a remote party over a voice-over-Internet protocol (VOIP) session. AMD-CV-0024267 (¶ [0009]), AMD-CV-0024277 (¶ [0104]). As its name suggests, VOIP is a technology that allows voice communication ("phone calls") to be transmitted using the IP protocol. Connections are established between IP addresses of different parties to facilitate their communication. As another example, Cole discusses performing connectivity tests such as an HTTP test for web browsing. AMD-CV-0024277 (¶ [0107]). As a person skilled in the art would have understood, HTTP (hypertext transfer

protocol) is an application-layer protocol used for transmitting web pages and other data over the Internet. It operates on top of the TCP/IP (transmission control protocol/Internet protocol) stack, which forms the foundation of Internet communication. I understand that Cole teaches that the connection manager maintains data related to network connections and provides a non-exhaustive list of examples. *See* AMD-CV-0024269-70 (¶¶ [0037]–[0038]). A person of skill in the art would have understood that Cole's connection manager would collect IP addresses as parameters of its network connections, as it has been common to store IP addresses for the purposes of connection management.

VI. "network connected device"

13. It is my opinion that the term "network connected device" of claims 16 and 20 is indefinite because it is circular.

14. Claim 16 recites:

> The network connected device of claim 15, wherein the one or more processors are configurable to: send the parameter values for determination of bandwidth, from the first endpoint device, to the tuner server that is configured to receive further parameter values for determination of bandwidth of network connections from a plurality of endpoint devices; send, from the first endpoint device to the tuner server, connection information for the next network connection, wherein the tuner server performs the determining and derives one or more parameter values for the transmission bandwidth; and receive, at the first endpoint device, from the tuner server, the one or more parameter values for the transmission bandwidth.

'634 Pat., 16:8–22.

15. Claim 20 recites:

> The network connected device of claim 15, further comprising the network connected device configurable to: monitor network traffic between the first endpoint device and the second endpoint device; transmit data associated with the network traffic from the first endpoint to the network connected device; determine, at the

> network connected device, an adjustment to the transmission bandwidth is desired; receive data for adjusting the transmission bandwidth from the network connected device; and adjust the transmission bandwidth responsive to the receiving.

Id., 16:36–48.

16. Both of these claims disclose the "network connected device of claim 15." Claim 15 recites that the network connected device is "acting as a tuner server." *Id.*, 15:46–47. As explained below, this means the "network connected device" is circular.

17. The "network connected device" is circular because claim 16 requires the "network connected device" to "send the parameter values for determination of bandwidth, from the first endpoint device, to the tuner server," *i.e.*, to send parameter values to itself. The claim also requires that the network connected device "send, from the first endpoint device to the tuner server, connection information for the next network connection" and "receive, at the first endpoint device, from the tuner server, the one or more parameter values for the transmission bandwidth," which is also circular. Similarly, claim 20 requires the "network connected device" to "transmit data associated with the network traffic from the first endpoint to the network connected device" and to "receive data for adjusting the transmission bandwidth from the network connected device," *i.e.*, transmitting data to and receiving data from itself, which is likewise circular.

18. It does not make sense for the "network connected device" to function circularly as it does in claims 16 and 20. Consequently, a person of ordinary skill in the art would not have understood the meaning of the term.

VII. Materials Considered

19. In reaching the opinions expressed in this Declaration, I have reviewed and considered the materials cited in this Declaration, including the '634 patent, the prosecution

history of the ’634 patent, and U.S. Patent Application Publication No. 2008/0080458 (“Cole”). I have also reviewed excerpts from the Merriam-Webster’s Collegiate Dictionary, New Oxford American Dictionary, and American Heritage Dictionary of the English Language, and Penguin Complete English Dictionary that include definitions of “area,” “geographical,” and “geography.” AMD-CV-0008686–701.

VIII. Legal Principles

20. I am not a patent attorney and do not have any formal legal training. But I have been informed of the following principles related to claim construction:

21. I understand that in construing patent claims, the terms should be accorded the meaning they would have to a person of ordinary skill in the art at the time of the invention. In assessing how a person of ordinary skill in the art at the time of the alleged invention (a “POSITA”) would understand a claim term, one must consider the claim language, the patent’s specification, and the patent’s prosecution history, which are collectively called the “intrinsic evidence.” The “prosecution history” of a patent is also called the “file history.” Based on the intrinsic evidence (*i.e.*, the claim language, specification, and file history of the patent), one should try to come to a conclusion about how a POSITA would understand the term in the context of the patent as of the effective filing date, *i.e.*, priority date, of the patent application.

22. I understand that a POSITA reads the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification. One must consider the specification to determine whether the inventor has employed any terms or words in a manner that is inconsistent with their plain and ordinary meaning.

23. I understand that in addition to the claims and the specification, one must review the patent's prosecution history, which is the complete record of all the proceedings before the Patent and Trademark Office, including any express representations made by the applicant regarding the scope of the claims. A patent applicant can limit claims during prosecution by, for example, altering claim language to overcome an examiner's rejection, clearly and unambiguously arguing to overcome or distinguish a reference, or clearly and unambiguously disavowing claim coverage.

24. I understand that in assessing how a POSITA would understand a claim term, it is permissible, and sometimes helpful, to consult other evidence that is not part of the "intrinsic evidence," such as expert and inventor testimony, dictionary definitions and technical treatises. This type of evidence is called "extrinsic evidence."

25. I understand that the plain and ordinary meaning of a claim term is the meaning that the term would have to a POSITA as of the effective filing date, *i.e.*, priority date, of the patent application.

26. I understand that a patent applicant may serve as his or her own lexicographer. In doing so, the applicant may rebut the presumption that the plain and ordinary meaning applies to claim terms if the applicant explicitly provides his or her own unique definition separate and apart from the plain and ordinary meaning. If the applicant explicitly defines a claim term, the applicant's definition will be controlling for that term. When a patent applicant chooses to act as his or her own lexicographer, the use of that claim term in the larger context of the specification may further inform the meaning of the term.

27. I understand that a patent term may be considered indefinite. A term is to be considered indefinite if a POSITA reading the term, in light of the specification and prosecution history of the patent, is not informed about the scope of the invention with reasonable certainty. Absolute precision, however, is not required—some amount of uncertainty about the meaning of the term is acceptable. But a patent must be precise enough to afford clear notice of what is claimed, thereby apprising the public of what is still open to them.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on April 19, 2025, at Chapel Hill, NC.

KEVIN JEFFAY

Attachment A
(Curriculum Vitae)

CURRICULUM VITAE

Kevin Jeffay
University of North Carolina at Chapel Hill
Department of Computer Science
Chapel Hill, NC 27599-3175
(919) 590-6238
jeffay@cs.unc.edu
http://www.cs.unc.edu/~jeffay

Education

Ph.D. Computer Science, University of Washington.
Honors: IBM Graduate Fellowship.

M.Sc. Computer Science, University of Toronto.
Honors: University of Toronto Open Fellowship.

B.S. Mathematics with Highest Distinction, University of Illinois at Urbana-Champaign.
Honors: Phi Beta Kappa, James Scholar.

Academic Experience

Chairman, Department of Computer Science, University of North Carolina at Chapel Hill, Chapel Hill, NC, 2014–2022, 2024.

Gillian T. Cell Distinguished Professor in Computer Science, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, 2008–present.

S. S. Jones Distinguished Professor in Computer Science, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, 2001–2008.

S. S. Jones Distinguished Term Associate Professor of Computer Science, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, 2000.

Associate Professor, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, 1996–2000.

Visiting Professor, Carnegie Mellon University, School of Computer Science, Pittsburgh, PA, 1994.

Assistant Professor, University of North Carolina at Chapel Hill, Department of Computer Science, Chapel Hill, NC, 1989–1995.

Honors and Awards

Alumni Achievement Award, University of Washington, Department of Computer Science and Engineering, June 2015.

Excellence in Teaching Award, Computer Science Student Association, University of North Carolina at Chapel Hill, Department of Computer Science, May 2011.

Favorite Faculty Award, an award given by the Computer Science majors of the 2010 graduating class, May 2010.

Carolina Women's Center Women's Advocacy Award, University of North Carolina at Chapel Hill, Chapel Hill, NC, March 2010.

Gillian T. Cell Distinguished Professor in Computer Science, University of North Carolina at Chapel Hill, College of Arts and Sciences, Chapel Hill, NC, June 2008.

Outstanding Teaching Award, an award given by the Computer Science majors of the 2008 graduating class, May 2008.

Favorite Faculty Award, an award given by the Computer Science majors of the 2004 graduating class, May 2004.

Edward Kidder Graham Outstanding Faculty Award, an award given by the Class of 2004 and the General Alumni Association, April 2004.

Edward Kidder Graham Advisor of the Year Award, an award given by the Class of 2004 and the General Alumni Association, April 2004.

IEEE Service Award, Service to the IEEE Technical Committee on Real-Time Systems, December 2001.

Outstanding Teaching Award, Computer Science Student Association, University of North Carolina at Chapel Hill, Department of Computer Science, May 2000.

S. Shepard Jones Distinguished Term Professorship, University of North Carolina at Chapel Hill, College of Arts and Sciences, Chapel Hill, NC, March 1999.

Award Papers:

ACM SIGCOMM 2000, 2003.

IEEE International Symposium on High Assurance Systems Engineering 1999, 2000.

IEEE Real-Time Technology and Applications Symposium, 1995.

ACM International Conference on Multimedia, 1994.

Computer Networks and ISDN Systems, 1994.

International Workshop on Network and Operating System Support for Digital Audio and Video, 1991, 1992, 1993, 1997.

Testifying Experience (Within Last Four Years)

Headwater Research LLC, v. Cellco Partnership, d/b/a Verizon Wireless and Verizon Corporate Services Group Inc., and *Headwater Research LLC v. T-Mobile USA, Inc. et al,* United States District Court for the Eastern District of Texas, Marshall Division, Case Nos. 2:23-cv-00352-JRG-RSP, 2:23-cv-00379-JRG-RSP, and 2:23-cv-00377-JRG-RSP.

Provided deposition testimony on behalf of defendants Verizon Wireless *et al*. and T-Mobile *et al.*

Joseph Taylor, Edward Mlakar, Mick Cleary, Eugene Alvis, and Jennifer Nelson, individual and on behalf of all others similarly situated, v. Google LLC, United States District Court for the Northern District of California, San Jose Division, Case No. 5:20-cv-07956-VKD.

Provided deposition testimony on behalf of defendant Google LLC.

Touchstream Technologies Inc., *v. Comcast Cable Communications, LLC, d/b/a XFINITY, et al.,* United States District Court for the Eastern District of Texas, Marshall Division, Case No. 2:23-cv-00062-JRG.

Provided deposition and trial testimony on behalf of defendant Comcast Cable Communications LLC.

Corrigent Corporation, *v. Cisco Systems, Inc.,* United States District Court for the Western District of Texas, Waco Division, Case No. 6:22-cv-369-ADA-DTG.

Provided deposition and trial testimony on behalf of defendant Cisco Systems.

Koninklijke KPN N.V. v. Cisco Systems, Inc., Arbitration Pursuant to the Rules of Arbitration of the International Chamber of Commerce, ICC Case No. 28424/PDP.

Provided deposition testimony on behalf of respondent Cisco Systems, Inc.

CosmoKey Solutions GMBH & Co. KG v. Duo Security, Inc. n/k/a Duo Security LLC and Cisco Systems, Inc., United States District Court for the District of Delaware, Case No. 18-1477-CFC.

Provided deposition testimony on behalf of defendants Duo Security LLC and Cisco Systems, Inc.

In re: Inter Partes review of U.S. Patent Nos. 9,407,564, 10,469,554, 10,951,680, 11,470,138, 11,677,798.

Provided deposition testimony on behalf of Patent Owner DISH Technologies LLC.

IBM Corporation, *v. Zynga, Inc.,* United States District Court for the District of Delaware, Case No. 1:22-cv-00590-GBW.

Provided deposition and trial testimony on behalf of plaintiff IBM Corp.

Netsocket Inc., *v. Cisco Systems, Inc.,* United States District Court for the Eastern District of Texas, Marshall Division, Case No. 2:22-00172-JRG.

Provided deposition testimony on behalf of defendant Cisco Systems, Inc.

DataCore Software Corporation, *v. Scale Computing, Inc.,* United States District Court for the District of Delaware, Case No. 22-535-GBW.

Provided deposition and trial testimony on behalf of defendant Scale Computing Systems.

Koninklijke Philips N.V. and Philips North America LLC, v. Hewlett Packard, Inc., United States District Court for the District of Delaware, Case No. 2:20-cv-1241-CFC.

Provided deposition and hearing testimony on behalf of defendant Hewlett Packard, Inc.

Smart Path Connections, LLC, *v. Nokia Corporation, et al.,* United States District Court for the Eastern District of Texas, Marshall Division, Case No. 2:22-cv-00296-JRG-RSP.

Provided deposition and trial testimony on behalf of defendant Nokia Corporation.

Lionra Technologies Ltd., *v. Cisco Systems, Inc.,* United States District Court for the Eastern District of Texas, Marshall Division, Case No. 2:22-cv-00305-JRG-RSP.

Provided deposition testimony on behalf of defendant Cisco Systems.

In re: Inter Partes review of U.S. Patent No. 7,895,641.

Provided deposition testimony on behalf of Petitioner Palo Alto Networks, Inc.

Correct Transmission, LLC, *v. Nokia Corporation, et al.,* United States District Court for the Eastern District of Texas, Marshall Division, Case No. 2:22-cv-0343-JRG-RSP.

Provided deposition testimony on behalf of defendant Nokia Corporation.

WSOU Investment, LLC d/b/a Brazos Licensing and Development v. Salesforce.com, Inc., United States District Court for the Western District of Texas, Waco Division, Case No. 6:20-cv-01167-ADA.

Provided deposition testimony on behalf of defendant Salesforce.com, Inc.

3G Licensing, S.A., Koninklijke KPN N.V., and Orange, S.A., v. HTC Corporation, United States District Court for the District of Delaware, Case Nos. 17-cv-83-GBW.

Provided trial testimony on behalf of defendant HTC Corporation.

In re: Inter Partes review of U.S. Patent No. 9,878,243.

Provided deposition testimony on behalf of Petitioner DraftKings Inc.

Attila Csupo, et al., v. Google LLC, Superior Court of the State of California for the County of Santa Clara, Case No. 1:19CV352557.

Provided deposition testimony on behalf of defendant Google LLC.

WSOU Investment, LLC d/b/a Brazos Licensing and Development v. Dell Technologies Inc., Dell Inc., EMC Corporation, and Vmware Inc., United States District Court for the Western District of Texas, Waco Division, Case Nos. 6:20-cv-00481 & -00486-ADA-DTG.

Provided deposition testimony on behalf of defendant Vmware, Inc.

Voxer, Inc. and Voxer IP LLC v. Facebook, Inc. and Instagram LLC, United States District Court for the Western District of Texas, Austin Division, Case No. 1:20-cv-00655 [ADA].

Provided deposition and trial testimony on behalf of defendants Facebook, Inc., and Instagram LLC.

Koninklijke KPN N.V., v. Telefonaktiebolaget LM Ericsson and Ericsson, Inc., United States District Court for the Eastern District of Texas, Marshall Division, Case No. 2:21-cv-113.

Provided trial testimony on behalf of defendants Telefonaktiebolaget LM Ericsson and Ericsson, Inc.

In re: Inter Partes review of U.S. Patent No. 7,783,788.

Provided deposition testimony on behalf of Petitioner Hewlett Packard Enterprise Company.

Egenera, Inc., v. Cisco Systems, Inc., United States District Court for the District of Massachusetts, Case No. 1-16-cv-11613-RGS.

Provided deposition and trial testimony on behalf of defendant Cisco Systems, Inc.

In re: Inter Partes review of U.S. Patent No. US 8,243,593.

Provided deposition testimony on behalf of Petitioner Cloudflare, Inc. and Sonicwall, Inc.

Flexiworld Technologies, Inc., v. Roku, Inc., United States District Court for the Western District of Texas, Waco Division, Case No. 6:20-cv-00819-ADA.

Provided deposition testimony on behalf of defendant Roku, Inc.

Longhorn HD, LLC v. Netscout Systems, Inc., United States District Court for the Eastern District of Texas, Marshall Division, Case No. 2:20-cv-00349.

Provided deposition and trial testimony on behalf of defendant Netscout Systems, Inc.

ClearDoc, Inc. v. Riverside, Inc., United States District Court for the District of Delaware, Case No. 21-1422-RGA.

Provided deposition testimony on behalf of defendant RiversideFM, Inc.

AlterWAN, Inc. v. Amazon.com, Inc. and Amazon Web Services, Inc., United States District Court for the District of Delaware, Case No. 1:19-cv-01544-MN.

Provided deposition testimony on behalf of defendants Amazon.com, Inc. and Amazon Web Services, Inc.

Industry Experience

Consultant, Mälardalen University, Vásteras, Sweden, 2001.

Member, Technical Advisory Board, Ganymede Software Inc., Research Triangle Park, NC, 1996–1999.

Consultant and Author, INTEROP Graduate Institute, SOFTBANK Inc., Foster City, CA, 1996–1997.

Consultant, National Science Foundation, Arlington, VA, 1995–2014.

Consultant, Monterey Technologies Inc., Cary, NC, 1994–1996.

Consultant, Hewlett-Packard Inc., Ink Jet Components Division, Corvallis, OR, 1993–1994.

Visiting Researcher, IBM T.J. Watson Research Center, Computer Systems Principles Group, Yorktown Heights, NY, 1986.

Consultant, Boeing Aerospace, Kent, WA, 1985–1986.

Software Engineer, R.R. Donnelley & Sons Company Inc., Technical Center, Chicago, IL, 1984.

Computer Programmer, US Army Corps of Engineers Construction Engineering Research Lab, Champaign, IL, 1981–1982.

Community Service

Consultant (unpaid), Children's Museum About the World (now called *Exploris*), Raleigh, NC, 1995–1996.

Professional Activities

Editor

Associate Editor, *Real-Time Systems*, Kluwer Academic Publishers, The Netherlands, 2003-2012.

Editor in Chief, *Multimedia Systems*, ACM/Springer-Verlag, Heidelberg, Germany, 2000–2001.

Editorial Board

Journal of Multimedia Tools and Applications, Kluwer Academic Publishers, 1994–1999.

Guest Editor

Computer Communications, special issue on system support for multimedia computing, Volume 18, Number 10, October 1995.

Executive Committees

ACM/SIGCOMM Internet Measurement Conference Steering Committee, 2005-2009.

College of Reviewers, Canada Research Chairs Program, 2004-2008.

Statistical and Applied Mathematical Sciences Institute (SAMSI) program on Network Modeling for the Internet, 2002-2004.

IEEE Technical Committee on Real-Time Systems, 2000-2007.

ACM Special Interest Group on Multimedia, 2000-2002.

Other Committees

IEEE Distinguished Visitors Program, 2004–2007.

Conference Program Chair

11th International Workshop on Quality-of-Service (Co-Chair), Monterey, CA, June 2003.

Sixth IEEE Symposium on Computers and Communications, Hammamet, Tunisia, July 2001.

21st IEEE Real-Time Systems Symposium, Orlando, FL, November 2000.

Tenth International Workshop on Network and Operating System Support for Digital Audio and Video, Chapel Hill, NC, June 2000.

Seventh ACM International Conference on Multimedia (Co-Chair), Orlando, FL, November 1999.

SPIE/ACM Multimedia Computing and Networking 1999 (Co-Chair), San Jose, CA, January 1999.

Sixth ACM International Conference on Multimedia (Associate Chair), Bristol, UK, September 1998.

IEEE International Conference on Multimedia Computing Systems (Associate Chair), Austin, TX, June 1998.

SPIE/ACM Multimedia Computing and Networking 1998 (Co-Chair), San Jose, CA, January 1998.

SPIE/ACM Multimedia Computing and Networking 1997 (Associate Chair), San Jose, CA, February 1997.

IEEE Workshop on Resource Allocation Problems in Multimedia Systems, Washington D.C., December 1996.

Second IEEE Real-Time Technology and Applications Symposium, Boston, MA, June 1996.

Conference General Chair

ACM SIGCOMM Internet Measurement Conference, San Diego, CA, October 2007.

22nd IEEE Real-Time Systems Symposium, London, UK, December 2001.

Tenth International Workshop on Network and Operating System Support for Digital Audio and Video, Chapel Hill, NC, June 2000.

Third IEEE Real-Time Technology and Applications Symposium, Montreal, Canada, June 1997.

IEEE Workshop on Resource Allocation Problems in Multimedia Systems, Washington D.C., December 1996.

Member of Conference Program Committee

21st IEEE International Conference on Network Protocols, Goettingen, Germany, October 2013.

18th IEEE International Conference on Network Protocols, Kyoto, Japan, October 2010.

ACM SIGCOMM 2010, New Delhi, India, August 2010.

17th IEEE International Conference on Network Protocols, Princeton, NJ, October 2009.

9th Passive and Active Measurement Conference 2008, Cleveland, OH, April 2008.

ACM SIGMETRICS 2008, Annapolis, MA, June 2008.

IEEE INFOCOM 2008, Phoenix, AZ, April 2008.

6th ACM SIGCOMM Workshop on Hot Topics in Networks, Atlanta, GA, November 2007.

15th IEEE International Conference on Network Protocols, Beijing, China, October 2007.

5th IEEE Workshop on Embedded Systems for Real-Time Multimedia, Salzburg, Austria, October 2007.

Workshop on Experimental Computer Science, ACM FCRC, San Diego, CA, June 2007.

15th International Workshop on Quality-of-Service, Chicago, IL, June 2007.

17th International Workshop on Network and Operating System Support for Digital Audio and Video, Urbana-Champaign, IL, June 2007.

10th IEEE Global Internet Symposium 2007, Anchorage, AK, May 2007.

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Fifth International Workshop on Multimedia Information Systems, Palm Springs, CA, October 1999.

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IEEE Workshop on QoS Support for Real-Time Internet Applications, Vancouver, Canada, June, 1999.

Second ACM Workshop on Internet Server Performance (held in conjunction with SIGMETRICS '99), Atlanta, GA, May 1999.

Seventh IEEE International Workshop on Parallel and Distributed Real-Time Systems, San Juan, Puerto Rico, April 1999.

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Sixth ACM International Conference on Multimedia, Bristol, UK, September 1998.

Third IEEE/ACM International Workshop on Multimedia Database Management Systems, Dayton, OH, August 1998.

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1995 ACM Conference on Organizational Computing Systems, Technical Track, Milpitas, CA, August 1995.

Fifth IEEE Workshop on Hot Topics in Operating Systems, Orcas Island, WA, May 1995.

15th International Conference on Distributed Computing Systems, Distributed Real-Time Systems Track

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13th International Conference on Distributed Computing Systems, Real-Time Issues Track, Pittsburgh, PA, May 1993.

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Rate-based Scheduling Technology for Latency-Sensitive Graphics Applications, J. Anderson, S. Baruah, K. Jeffay, R. Taylor, National Science Foundation, grant number ITR 00-82866, September 2000, 3.5 years, $350,000.

Active Router Queue Management for Congestion Control and Quality-of-Service, K. Jeffay, F.D. Smith, National Science Foundation, grant number ITR 00-82870, September 2000, 3 years, $451,903.

Internet Measurements and Analysis to Support the nanoManipulator and Tele-Immersion, F.D. Smith, K. Jeffay, P. Jones, IBM Shared University Research Grant, September 2000, 1 year, $250,000.

The Performance of Differentiated Services Implementations for Supporting Distributed Virtual Environment Applications, K. Jeffay, North Carolina Network Initiative, September 2000, 1 year, $25,000.

Empirical Application-Workload Characterizations for Advanced Networks, K. Jeffay, F.D. Smith, Sun Microsystems, September 2000, $79,000.

Empirical Application-Workload Characterizations for Advanced Networks, F.D. Smith, K. Jeffay, MCNC, September 2000, 1 year, $50,000.

A Quality-of-Service Network for the nanoManipulator, K. Jeffay, Cabletron Inc. and the North Carolina Network Initiative, September 1999, $25,000.

Interactive Graphics for Molecular Studies and Microscopy — Supplement for Collaborative Science, F.P. Brooks, D. Erie (Chemistry), K. Jeffay, J. Samulski (Gene Therapy), F.D. Smith, D. Sonnenwald (Information and Library Science), R. Superfine (Physics and Astronomy), R. Taylor, National Institute of Health, October 1998, 4 years, $1,902,544.

Computing Power for Collaborative Science, S.R. Aylward, G. Bishop, D.W. Brenner, E. Bullitt, E.L. Chaney, V.L. Chi, B.J. Dempsey, N. England, A.G. Gash, D. Fritsch, H. Fuchs, B. Hemminger, J. Hermans, K. Jeffay, K. Keller, A. Lastra, M. Lin, D. Manocha, L.S. Nyland, S.M. Pizer, J.W. Poulton, J.F. Prins, J. Rosenman, F.D. Smith, R. Superfine, R.M. Taylor, S. Tell, G. Tracton, A. Tropsha, S. Washburn, G. Welch, Intel Corporation, August 1998, 3 years, $2,858,747. PI on *Multimedia Networking* and *A Distributed Teaching Laboratory for Networking and Internet Technologies* sections (F.D. Smith, B.J. Dempsey, Co-PIs), $557,669.

Empirical Application-Workload Characterizations for Advanced Networks, F.D. Smith, K. Jeffay, North Carolina Network Initiative, September 1998, $40,000.

Congestion control for high-speed networks, F.D. Smith, K. Jeffay, IBM Corporation, 1998, $20,000.

A Communications Middleware For Immersive Distributed Virtual Environments, K. Jeffay, North

Carolina Network Initiative, 1998, $15,000.

Technology for Real-Time Services in Protocol Stack Implementations, K. Jeffay, IBM Corporation, 1997, $80,000.

Internet Access to UNC-CH Advanced Microscopy Facilities for Science Education Outreach, K. Jeffay, R. Superfine (Physics and Astronomy), G. Jones (Education), University of North Carolina at Chapel Hill Instructional Technology Award, 1997, $29,750.

Support for the Real-Time Technology and Applications Symposium, K. Jeffay, Office of Naval Research, 1997, $7,000.

Research Experience For Undergraduates supplement to *Object Sharing Technology For Real-Time Systems*, J. Anderson, K. Jeffay, National Science Foundation, 1996, $10,000.

Infrastructure for Research in Collaborative Systems, S.F. Weiss, J.B. Smith, K. Jeffay, P. Dewan, P. D. Stotts, D.K. Smith, F.D. Smith, W. Oliver (U.S. Armed Forces Institute of Pathology), National Science Foundation, grant number CDA-9624662, August 1996, 5 years, $1,260,830.

Collaboration Bus: An Infrastructure for Supporting Interoperating Collaborative Systems, P. Dewan, K. Jeffay, H. Abdel-Wahab (Old Dominion University), P. D. Stotts, L. Nyland, J.B. Smith, J. Mchugh (Portland State University), J. Menges (Hewlett Packard), Advanced Research Projects Agency, grant number 96-06580 (High Performance Distributed Services Technology), 1996, $973,334.

Object Sharing Technology For Real-Time Systems, J. Anderson, K. Jeffay, National Science Foundation, grant number CCR 95-10156, 1996, $209,442.

Flexible Shared Windows, P. Dewan, K. Jeffay, National Science Foundation, grant number IRIS 95-08514, 1995, $343,811.

An ATM Testbed For Multimedia Networking and Computer-Supported Cooperative Work, K. Jeffay, IBM Corporation, 1995, $400,000.

An Examination of Flow and Congestion Control Mechanisms for Media Transmission in Collaborative Systems, K. Jeffay, IBM Corporation, 1995, $125,242.

Software Infrastructure for the Rapid Development of Interactive and Collaborative Educational Simulations, J.F. Prins, K. Jeffay, P.D. Stotts, L.S. Nyland, Advanced Research Projects Agency, grant number 95-36871 (Computer Aided Education and Training Initiative), 1995, $200,000.

A Proposal For Network Routers, K. Jeffay, IBM Corporation, Research Triangle Park, NC, 1994, $40,000.

System Support For Video Teleconferencing Across Local Area Networks, K. Jeffay, Intel Corporation, 1993, $253,385.

The Integration and Use of Digital Audio and Video in Desktop Computing Environments, K. Jeffay, IBM Corporation, 1993, $100,000.

Construction of a UNC-Tektronix MBONE Link, K. Jeffay, Tektronix Corporation, 1993, $10,000.

An Empirical Determination of the Limits of Human Perception of Properties of Digital Audio and Video Streams, K. Jeffay, University of North Carolina Research Council, 1993, $2,000.

Processor and Resource Allocation Problems in Hard-Real-Time Systems: Theory and Practice, K. Jeffay, National Science Foundation, RIA Award, 1991, $59,400.

Accommodating Continuous Media in a Local Area Network: An exercise in distributed real-time

computing, K. Jeffay, University of North Carolina Junior Faculty Development Award, 1990, $3,000.

Building and Using a Collaboratory: A Foundation for Supporting and Studying Group Collaborations, J.B. Smith, F.D. Smith, P. Calingaert, K. Jeffay, J.R. Hayes, D. Holland, M. Lansman, National Science Foundation, grant number ICI-9015443, 1990, $946,000.

Enhanced program of research and teaching in communications software and distributed systems, K. Jeffay, IBM Corporation, 1989, $429,000.

The Design and Construction of Predictable Real-Time Systems, K. Jeffay, Digital Faculty Program Award, Digital Equipment Corporation, 1989, $180,000.

Invited Presentations

Keynote Addresses

Network Neutrality Considered Harmful,

PearlHacks, University of North Carolina at Chapel Hill, Chapel Hill, NC, March 2014.

Carolina Science Café, University of North Carolina at Chapel Hill, Chapel Hill, NC, May 2015.

Network Neutrality Considered Harmful, Revisiting the Quality-of-Service Morass

ACM International Workshop on Network and Operating System Support for Digital Audio and Video, Newport, RI, May 2006.

Rate-Based Resource Allocation Methods for Multimedia Computing

SPIE Multimedia Computing and Networking 2003, Santa Clara, CA, January 2003.

Network Support For Distributed Virtual Environments: The Tele-nanoManipulator

NCNI Advanced Networking Symposium, Research Triangle Park, NC, May 1999.

The Internet 2 Spring Members Meeting (presented jointly with R.M. Taylor), Washington, DC, April 1999.

Network Support For Distributed, Immersive, Virtual Environments

Workshop on Automated Control of Distributed Instrumentation, Beckman Institute for Advanced Science and Technology, University of Illinois at Urbana-Champaign, Urbana, IL, April 1999.

The Future of Networking: The Networking Revolution Has Yet to Begin

North Carolina Governor's Board of Science and Technology Retreat, Banner Elk, NC, September 1998.

Distinguished Lectures

The Synthetic Traffic Generation Problem: The least sexy problem in computer networking

University of Minnesota, Minneapolis, MN, January 2008.

The Effect of Active Queue Management on Web Performance: The Good, the Bad, and the Ugly

University of Nebraska, Lincoln, NE, November 2003.

University of Pennsylvania, April 2004.

The Evolution of Quality-of-Service on the Internet

Mälardalen University, Sweden, February 2001.

Colloquia

Efficient Topology Management and Geographic Routing in High-Capacity Continental- Scale Airborne Networks

University of Virginia, November 2017.

The Evolution of Quality-of-Service on the Internet

IEEE Computer Society Seattle Chapter, Seattle, WA, September 2005.

Modeling and Generating TCP Application Workloads

Georgia Institute of Technology, Atlanta, GA, September 2005.

Microsoft Research, Redmond, WA, September 2005.

Worcester Polytechnic Institute, Worcester, MA, July 2005.

Cisco Systems, RTP, NC, May 2005 (presently jointly with F. Hernandez-Campos and F.D. Smith).

A Rate-Based Execution Abstraction For Embedded Real-Time Systems

University of Pennsylvania, April 2004.

How "Real" Can Synthetic Network Traffic Be?

University of Virginia, March 2004.

Non-Parametric Approach to Generation and Validation of Synthetic Network Traffic

Columbia University, New York, NY, January 2004.

Is Explicit Congestion Notification (ECN) Worthwhile?

Cisco Systems, San Jose, CA, October 2003.

Intel Architecture Labs, Hillsboro, OR, October 2003.

Tuning RED for Web Traffic: RED Considered Harmful?

Sprint Advanced Technology Research Laboratories, San Francisco, CA, March 2000.

University of Illinois at Urbana-Champaign, Urbana, IL, March 2000.

Internet Traffic: Measurement & Generation

Ganymede Software, Research Triangle Park, NC, June 1999. (Presented jointly with F.D. Smith.)

Lightweight Active Router-Queue Management for Multimedia Networking

University of Toronto, October 2000.

HP Laboratories, Palo Alto, CA, January 1999.

Sprint Advanced Technology Research Laboratories, San Francisco, CA, January 1999.

A Better-Than-Best-Effort Service For UDP: Lightweight Active Router-Queue Management for Multimedia Networking

University of Virginia, January 1999.

Congestion Control Mechanisms for Real-Time Communications on the Internet

IBM Networking Systems, Research Triangle Park, NC, November 1998.

A Better Than Best-Effort Forwarding Service For UDP

Microsoft Research, Redmond, WA, March 1998.
IBM Networking Systems, Research Triangle Park, NC, March 1998.

Multimedia Networking Research at UNC Chapel Hill

IBM Networking Systems, Research Triangle Park, NC, February 1998.
Lucent Technologies, Bell Laboratories, Holmdel, NJ, June 1997.

Design Principles for Distributed, Interactive, Virtual Laboratories

Mitsubishi Electric Research Laboratory, Cambridge, MA, January 1998.
Lucent Technologies, Bell Laboratories, Holmdel, NJ, June 1997.

The Performance of Two-Dimensional Media Scaling for Internet Videoconferencing

Mitsubishi Electric Research Laboratory, Cambridge, MA, January 1998.
Carnegie Mellon University, Pittsburgh, PA, March 1997.

Some Approaches to Enabling Real-Time Computation on Desktop Operating Systems

Honeywell Technology Center, Minneapolis, MN, October 1996.

Two-Dimensional Scaling Techniques for Adaptive, Rate-Based Transmission Control of Live Audio and Video Streams

Oregon State University, Corvallis, OR, May 1996.

A Router-Based Congestion Control Scheme For Real-Time Continuous Media

Intel Architecture Development Laboratory, Hillsboro, OR, May 1996.
NetEdge Inc., Research Triangle Park, NC, March 1996.
North Carolina State University, Raleigh, NC, March 1996.

A Hybrid Reservation-Based/Best-Effort Transmission Scheme For Real-Time Transmission of Multimedia Data

Intel Research Council, Hillsboro, OR, November 1995.

Operating System Support For Multimedia Computing

IBM Networking Systems, Research Triangle Park, NC, July 1995.

Network Support For Multimedia Computing

IBM Networking Systems, Research Triangle Park, NC, July 1995.

A Rate-Based Execution Abstraction For Multimedia Computing

Tektronix Computer Research Laboratory, Beaverton, OR, May 1996.
INRIA, Rocquencourt, France, December 1995.
AT&T Bell Laboratories, Murray Hill, NJ, July 1995.

A Theory of Rate-Based Scheduling

Carnegie Mellon University, Pittsburgh, PA, August 1994.

Demonstration of Videoconferencing Over Packet-Switched Internetworks

Global Lecture Hall of the U.S.-Russian Electronic Distance Education System/TELE-TEACHING '93, Trondheim, Norway (via satellite from Chapel Hill), August 1993.

Transport and Display Mechanisms For Multimedia Conferencing Across Packet-Switched Networks

York University, York, England, November 1993.

Purdue University, West Lafayette, IN, February 1993.

Intel Architecture Development Laboratory, Hillsboro, OR, February 1993.

Oregon Graduate Institute, Beaverton, OR, February 1993.

Second MCNC/NSF Packet Video Workshop, Research Triangle Park, NC, December 1992.

Carnegie Mellon University, Pittsburgh, PA, November 1992.

Multimedia and Conferencing Research at UNC-CH

IBM Multimedia Networking, Research Triangle Park, NC, September 1992.

System Support for Synchronous Collaboration

North Carolina Artificial Intelligence and Advanced Computing Symposium, Raleigh, NC, March 1992.

Software Architectures for Predictable Real-Time Computer Systems

Carnegie Mellon University, Pittsburgh, PA, March 1992.

Operating System Requirements for Digital Audio and Video

MCNC/NSF Packet Video Videoconferencing Workshop, Research Triangle Park, NC, December 1991.

Some Experiments With Live Digital Audio and Video on a Local-Area Network

IBM European Networking Center, Heidelberg, Germany, November 1991.

Network and Operating System Support for Digital Audio and Video

Duke University, Durham, NC, November 1994.

Carnegie Mellon University, Pittsburgh, PA, April 1994.

Intel Corporation, Hillsboro, OR, December 1993.

IBM Networking Systems, Research Triangle Park, NC, June 1992.

IBM TJ Watson Research Center, Yorktown Heights, NY, March 1992.

University of Washington, Seattle, WA, February 1992.

Old Dominion University, Norfolk, VA, October 1991.

Systems Research in the UNC Collaboration Project

Intel Architecture Development Laboratory, Hillsboro, OR, May 1992.

University of Colorado, Boulder, CO, March 1991.

Some Deterministic Resource Allocation Problems in Real-Time Computer Systems

Research Triangle Institute, Research Triangle Park, NC, June 1990.

University of North Carolina at Chapel Hill, Department of Operations Research, Chapel Hill, NC, October 1989.

The Real-Time Producer/Consumer Paradigm: Towards Verifiable Real-Time Computations

Carnegie-Mellon University, Pittsburgh, March 1991.

Duke University, Durham, NC, June 1990.
Technical University of Denmark, Lyngby, Denmark, September 1989.
University of California at Davis, Davis, CA, April 1989.
University of Minnesota, Minneapolis, MN, April 1989.
Purdue University, West Lafayette, IN, April 1989.
University of North Carolina at Chapel Hill, Chapel Hill, NC, April 1989.
University of British Columbia, Vancouver, BC, Canada, April 1989.
Rice University, Houston, TX, March 1989.
University of Arizona, Tucson, AZ, March 1989.
Oregon Graduate Center, Beaverton, OR, March 1989.
Tektronix Computer Research Laboratory, Beaverton, OR, March 1989.
University of Colorado, Boulder, CO, March 1989.
IBM TJ Watson Research Center, Yorktown Heights, NY, March 1989.
IBM Systems Integration Division, Owego, NY, March 1989.
New York University, New York, NY, March 1989.
Bell Communications Research, Morristown, NJ, March 1989.

Concurrent Programming With Time

Olivetti Research Center, Menlo Park, CA, December 1987.
IBM TJ Watson Research Center, Yorktown Heights, NY, September 1987.
Columbia University, New York, NY, September 1987.

Short Courses

Trends in Congestion Control and Quality-of-Service: Active queue management on the Internet of the future

Mälardalen University, Sweden, February 2001.

Rate-Based Execution Models For Real-Time Multimedia Computing

Scuola Superiore Santa Anna, Pisa, Italy, September 1997.

Tutorials

Issues in Multimedia Delivery Over Today's Internet

IEEE International Conference on Multimedia Computing Systems, Austin, TX, June 1998.

Systems Issues in the Design and Realization of Desktop Videoconferencing Systems,

Second ACM International Conference on Multimedia, San Francisco, CA, October 1994.

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