EXHIBIT 9

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 Darrell Long Regarding U.S. Patent No. 9,529,767

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I, Darrell Long, declare as follows:

I. Introduction

1. I have been retained by defendants Advanced Micro Devices, Inc. and Pensando Systems, Inc. to offer my opinion on claim construction issues relating to U.S. Patent No. 9,529,767. I am compensated at a rate of $750 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 Distinguished Professor of Engineering Emeritus at the University of California, Santa Cruz. I received my Ph.D. in Computer Science from the University of California, San Diego. I have done extensive work in the field of computer storage, and became an IEEE Fellow in 2006 for contributions to storage systems architecture and performance. My professional activities included serving as the editor-in-chief of the ACM Transactions on Storage, and a founder of the Conference on File and Storage Technologies. My qualifications are further set out in my curriculum vitae, which is attached to this declaration.

III. Level of Ordinary Skill in the Art of the ’767 Patent

3. From my review of the specification and the claims, I have determined that the field of the ’767 patent is computer storage technology. This is consistent with how the ’767 patent characterizes the field of the alleged invention:

> The present invention relates generally to the field of storage devices. More specifically, the present invention is related to a system and method for abstracting SATA and/or SAS storage media devices via a full duplex queued command interface to increase performance, lower host overhead, and simplify scaling storage media devices and systems.

’767 pat., 1:13-19.

4. In determining the characteristics of a hypothetical person of ordinary skill in the art ("POSITA") of the '767 patent at the time of the claimed invention, I considered several things, including various prior art techniques relating to computer storage, the type of problems that such techniques gave rise to, and the rapidity with which innovations were made. I also considered the sophistication of the technologies involved and the educational background and experience of those actively working in the field at the time. I also considered the level of education that would be necessary to understand the '767 patent. Finally, I placed myself back in the relevant period of time, and I considered the designers, developers, and engineers that I have worked with and managed in the field of computer storage.

5. It is my conclusion that the level of ordinary skill in the art for the '767 patent is a bachelor's degree in computer science, electrical engineering, computer engineering, or a similar field with at least two years of experience in computer storage, or a person with a master's degree in computer science, electrical engineering, computer engineering with a specialization in computer storage. A person with less education but more relevant practical experience may also possess the level of ordinary skill. My own qualifications exceed the level of ordinary skill because I have a Ph.D. in Computer Science, and have over a decade of practical experience in the field of computer storage.

IV. Overview of the '767 Patent

6. According to the '767 patent, prior art techniques relied on specific interface protocols, like SATA and SAS, to interact with storage media devices. '767 patent, 1:21-25. Under the prior art techniques, a host computer must "support and manage both protocols" to access both SATA and SAS storage media devices. *Id.*, 1:39-40. Specifically, the host computer needed to use a SATA controller or a SAS controller to communicate with SATA storage media devices, and a SAS controller to communicate with SAS storage media devices. *Id.*, 1:65-2:8.

The prior art techniques purportedly failed to provide a simplified system that allowed a host computer to access both SATA and SAS storage media devices without having to managing both protocols. *Id*., 2:14-20.

7. The '767 patent allegedly provides a solution to the above issue by providing a system supported by an "abstraction protocol." '767 patent, 2:24-26. In this purported storage media device system, the host computer does not need to communicate with SATA and SAS storage media devices respectively. Instead, the host computer communicates with a "master controller," which in turn communicates with an "edge controller" through the "abstraction protocol," and the "edge controller" further communicates with a mixture of storage media devices. *Id*., 2:26-40.

8. According to the '767 patent, because the SAS and SATA protocols are pushed to the edge and the "abstraction protocol" provides "high-level access commands to storage media devices," the host does not to deal with the complexities of both protocols. '767 patent, 4:4-22.

V. "Abstraction Protocol" (Claims 1, 2, 4, 6, 16)

A. The plain and ordinary meaning of "abstraction protocol" is a simplified or generalized storage protocol, and it would not have connoted a structure to a POSITA.

9. Independent claims 1 and 16 each recite an "abstraction protocol." The portions of claims 1 and 16 reciting abstraction protocol are reproduced below:

> 1. A routable packet-switched network supported by an *abstraction protocol* comprising:
>
> …
>
> wherein the master controller and the edge controller communicate via the *abstraction protocol*, the *abstraction protocol* comprising a full-duplex protocol supporting full command queuing for the at least one storage media device; and

> wherein the edge controller further comprises at least one other master controller further in communication with at least one other edge controller, when the edge processing element associated with the edge controller authors *abstract protocol* messages intended for the other edge controller.
>
> 16. A routable packet-switched network supported by an *abstraction protocol* comprising:
>
> …
>
> at least one storage media device interface to communicate with at least one storage media device, wherein the first and second master controller, the first edge controller and the second edge controller communicate via the *abstraction protocol*, the *abstraction protocol* comprising a full-duplex protocol supporting full command queuing for the at least one storage media device.

10. "Abstraction protocol" did not have a plain and ordinary meaning to a POSITA in the field of computer storage at the time of the filing of the '767 patent. My opinion is based upon my knowledge and experience in the field of computer storage, which includes years of research, numerous publications, serving as a reviewer of publications, and serving as the editor-in-chief of the ACM Transactions on Storage. In addition, I am unaware of the term "abstraction protocol" having an established use or meaning in the field's relevant academic or industrial literature (including patents) before the '767 patent.

11. "Protocol" is a term that generally has a plain and ordinary meaning in computing as well as in computer storage. A POSITA would have understood that a protocol is a set of rules (or conventions) that define a procedure to follow when transmitting and receiving data between devices, including the format, ordering and timing of data. In computer storage, a storage protocol is a set of rules that define a procedure to follow when transmitting and receiving data between computing devices and storage devices. The plain and ordinary meaning of protocol in this field is consistent with the following dictionary definitions that I find relevant:

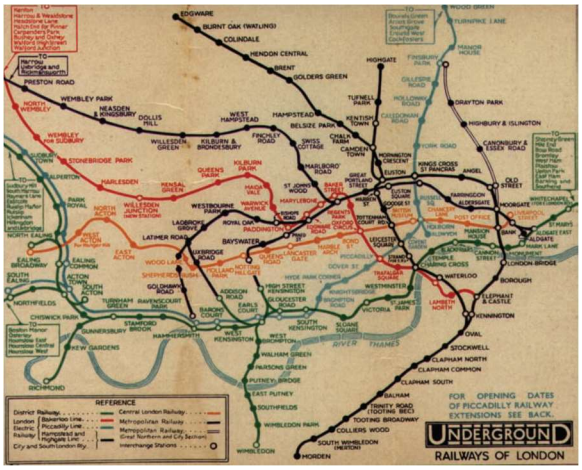
Source	Definition
Definition of "protocol," Dictionary of Computer Networking AMD-CV-0008714-16	"In networking and communications, the formal specification that defines the procedures to follow when transmitting and receiving data. Protocols define the format, timing, sequence, and error checking used on the network."
Definition of "protocol," Dictionary of Computing AMD-CV-0008721-23	"[T]he pre-agreed signals, codes and rules to be used for data exchange between systems"
Definition of "protocol," Newton's Telecom Dictionary AMD-CV-0008734-37	"Protocols define the rules by which devices talk with each other, or more formally, a protocol is a set of rules governing the format of messages that are exchanged between computers and people. … A protocol defines the procedure for adding order to the exchange of data (i.e. a 'conversation.') A protocol is a specific set of rules, procedures, or conventions relating to format and timing of data transmission between two devices. It is a standard procedure that two data devices must accept and use to be able to understand each other. The protocols for data communications cover such things as framing, error handling, transparency and line control. There are three basic types of protocol: character oriented, byte oriented, and bit-oriented."
Definition of "protocol," Minoli-Cordovana's Authoritative Computer & Network Security Dictionary AMD-CV-0008728-30 (citations omitted)	"A format for transmitting data between devices. Agreed-upon methods of communications used by computers. A specification that describes the rules and procedures that products should follow to perform activities on a network, such as transmitting data. If they use the same protocols, products from different vendors should be able to communicate on the same network. A set of rules (i.e., formats and procedures) to implement and control some type of association (e.g., communication) between systems. In particular, a series of ordered steps involving computing and communication that are performed by two or more system entities to achieve a joint objective."

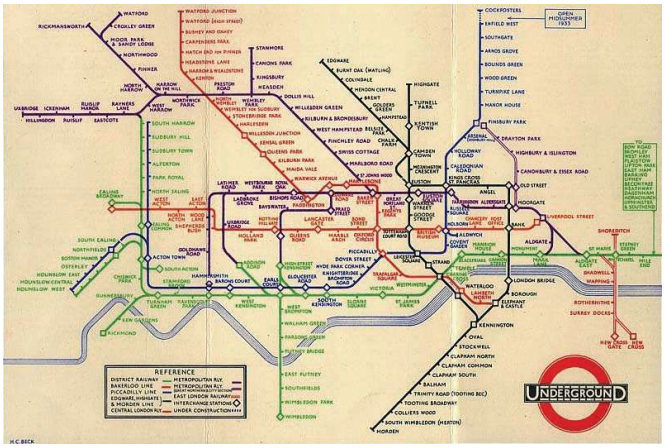
12. The '767 patent mentions two well-known storage protocols: Serial Attached SCSI ("SAS") and Serial Advanced Technology Attachment ("SATA"). SAS and SATA are both industry standards. Documents, known as specifications, describe each protocol. This allows implementers of the protocol to create devices that can work with other devices that

support the same protocol. As one example, SAS is based on the SCSI specification, and the SCSI specification dedicates hundreds of pages to laying out the data structures, state machines, and other details necessary to send and receive SCSI commands.

13. While "abstraction" is a well-known technique in computer science generally, it does not have a specialized meaning in computer storage. Abstraction, in the sense of a verb, is a process of simplifying or generalizing often used in engineering and software design. For example, simplifying or generalizing may involve hiding underlying details or complexities. As a noun, abstraction refers to the simplified or generalized result of that process. Jeff Kramer's article "Is Abstraction the Key to Computing?," published in the Communications of the Association of Computing Machinery, illustrates the meaning of abstraction generally and in computer science. AMD-CV-0008990-95.

14. An example of abstraction is Harry Beck's redesign of the London Underground map. As Kramer recounts, the 1928 map was an overlay of the London Underground system onto a conventional geographical map. *Id.* at 92. Beck "produced the first abstract, schematic representation, simplifying the curves to just horizontal, vertical and diagonal lines and where the distances between stations were no longer proportional to the geographical distances." *Id.* The original map is on the left, and the abstraction is on the right:





Id. at 93.

15. Plaintiffs' dictionary definitions reinforce my opinion of "abstraction." The *Modern Dictionary of Electronics* defines "abstraction" as "[a] simplified description or specification…that emphasizes some of the system's details or properties while suppressing others." CV-AMD0017608-23. The *Microsoft Computer Dictionary*'s definitions of abstraction are more narrowly drawn to the use of the term in the software development field. Still, they are consistent with abstraction's meaning of simplifying, generalizing, or hiding underlying details. *See* CV-AMD0017595-607.

Source	Definition
Definition of "abstraction," Modern Dictionary of Electronics CV-AMD0017608-23	"A simplified description or specification of a system that emphasizes some of the system's details or properties while suppressing others. A high level of abstraction or a highly abstract machine is one in which very few machine details are apparent to a programmer, who sees only a broad set of machine concepts. Abstract machines are created by surrounding a primitive machine with layers of operating systems. To converse with higher levels of abstract machines, the user needs higher levels of languages."
Definition of "abstraction," Microsoft Computer Dictionary CV-AMD0017595-607	"1. Broadly, the use of specialized software, such as an application programming interface (API), as a means of shielding software from device dependencies or the complexities of underlying software. For instance, hardware abstraction enables programs to focus on a task, such as communications, instead of on individual differences between communications devices. 2. In object-oriented programming, the process of reducing an object to its essence so that only the necessary elements are represented. Abstraction defines an object in terms of its properties (attributes), behaviors (functionality), and interface (means of communicating with other objects)."

16. The plain meaning of "abstraction" and "protocol" would have suggested to a POSITA that an "abstraction protocol" is a simplified or generalized protocol. But, even with that understanding, a POSITA would not have understood "abstraction protocol" to connote

structure. The specification describes an abstraction protocol as a novel storage protocol, implemented in software, that results from abstracting then-existing storage protocols:

> This invention simplifies a host that accesses SATA and SAS storage media devices by abstracting the SATA and SAS protocols with one full duplex protocol that supports full command queuing to each storage media device…. The invention is comprised of both hardware (system–architecture) and software (method–abstraction protocol). The simplified abstraction protocol provides high-level access commands to storage media devices. A high-level command may ultimately resolve to several commands at the SATA or SAS interface, allowing the host to issue and track fewer commands.

'767 pat., 3:65-4:8. The specification does not define an abstraction protocol or describe an implementation of an abstraction protocol. Instead, the specification recites features or properties that an abstraction protocol should have:

> This abstraction protocol is *performance-centric* and *supports common high-level read and write access to a pool of storage media devices*, each of which may have a SATA or SAS interface. The abstraction protocol is *link-agnostic* and may be carried via a multiplicity of direct attach or networked interfaces, including but not limited to PCIe, Ethernet …, Infiniband, USB, ThunderBolt, Firewire, and/or custom interfaces.

Id. at 4:35-42 (emphasis added).

17. The specification recites that the "abstraction protocol" is "performance centric" and "link-agnostic" (*id*. at 4:35, 38), supports "high-level read and write access to a pool of storage media devices" (*id*. at 4:35-37), and that "the master controller and the edge controller communicate via the abstraction protocol" (*id*. at 8:47-48). However, these descriptions focus solely on the functions and features of an "abstraction protocol" and do not inform a POSITA about the exact nature of the "abstraction protocol," nor do they inform a POSITA how to implement an abstraction protocol.

B. "Abstraction protocol" is drafted in a means-plus-function format.

1. Step 1: "Abstraction protocol" is defined only by the function it performs and does not connote sufficiently definite structure to a POSITA.

18. As I explained in paragraph 10, "abstraction protocol" was not a term used in the field of computer storage before the filing of the '767 patent. This is further confirmed by the specification, which describes an "abstraction protocol" as a novel, simplified storage protocol that is implemented in software. '767 pat., 3:65-4:8. The remainder of the specification does not describe or define the abstraction protocol in sufficient detail to connote a definite structure (e.g., a software implementation of an abstraction protocol) and instead recites functions or features of an abstraction protocol. *See supra* ¶¶16-17.

19. In the claim language, "abstraction protocol" is only defined by the function it performs, which is enabling communication of commands between master controllers and edge controllers for a storage media device. This is evident from the claim language itself:

> 1. A routable packet-switched network supported by an *abstraction protocol* comprising:
>
> …
>
> wherein the *master controller and the edge controller communicate via the abstraction protocol*, the *abstraction protocol* comprising a full-duplex protocol supporting full command queuing *for the at least one storage media device*; and…
>
> 16. A routable packet-switched network supported by an *abstraction protocol* comprising:
>
> …
>
> at least one storage media device interface to communicate with at least one storage media device, wherein *the first and second master controller, the first edge controller and the second edge controller communicate via the abstraction protocol*, the

> *abstraction protocol* comprising a full-duplex protocol supporting full command queuing *for the at least one storage media device*.

20. "Abstraction protocol" is recited in the claims as a functional placeholder because it only describes the purpose or role of the protocol without providing any details of its underlying structure. The remainder of the claim language merely reinforce the function the abstraction protocol performs and do not connote structure. For example, the claims recite "[a] routable packet-switched network *supported by* an abstraction protocol" and "the master controller and the edge controller communicate *via* the abstraction protocol." A POSITA would only have understood the function served by the "abstraction protocol" (supporting and facilitating communication between master and edge controllers) but not the structure that performs the function. The claim language further recites that "the abstraction protocol compris[es] a full-duplex protocol," which merely indicates that the abstraction protocol must provide full-duplex communication but does not inform a POSITA of how the abstraction protocol implements that feature. Similarly, "supporting full command queuing" is another recitation of a property of the claimed abstraction protocol with no indication of how it is implemented.

2. Step 2: The specification does not disclose sufficient structure that corresponds to the claimed function.

21. As explained in ¶19, from reading claims 1 and 16, a POSITA would have identified that the claimed function of the "abstraction protocol" is enabling communication of commands between master controllers and edge controllers for a storage media device:

> 1. A routable packet-switched network supported by an *abstraction protocol* comprising:
>
> …
>
> wherein the *master controller and the edge controller communicate via the abstraction protocol*, the *abstraction protocol*

> comprising a full-duplex protocol supporting full command queuing *for the at least one storage media device*; and…
>
> 16. A routable packet-switched network supported by an *abstraction protocol* comprising:
>
> …
>
> at least one storage media device interface to communicate with at least one storage media device, wherein *the first and second master controller, the first edge controller and the second edge controller communicate via the abstraction protocol*, the *abstraction protocol* comprising a full-duplex protocol supporting full command queuing *for the at least one storage media device*.

22. Having reviewed the specification, I conclude that the specification does not disclose a sufficient structure that performs the identified claimed function. As I explained above in paragraphs 16-17, the specification does not disclose an implementation of an abstraction protocol. The specification states that the abstraction protocol is software but does not disclose algorithms, pseudocode, flowcharts, state diagrams, or other implementation details for the abstraction protocol. The specification also does not identify any existing and known protocol that is an abstraction protocol. Instead, the specification describes the abstraction protocol as novel and distinguishes the existing and known SAS and SATA protocols from the abstraction protocol.

23. Finally, stating that an abstraction protocol results from "abstracting" an existing storage protocol (SAS and SATA) ('767 pat., 3:65-4:2) is also insufficient to disclose structure because abstraction in software development is a highly-subjective design process. In something as complex as a storage protocol, numerous design choices exist, including the format of messages, how to define commands, and how the messages or commands flow between entities in communication. How different POSITAs would simplify or generalize a storage protocol

would vary greatly depending upon their own assessments of how to balance competing design tradeoffs. Thus, even if a POSITA is told to create an abstraction protocol by abstracting an existing protocol, a POSITA would not immediately know what that structure would look like until they go through significant design efforts.

24. I am informed that a claim is invalid for indefiniteness if the claim, read in light of the specification and the prosecution, fails to inform a POSITA with reasonable certainty of the scope of the invention. Because claims 1 and 16 require an "abstraction protocol," the claims, in view of the specification and prosecution history, fail to inform a POSITA of the scope of the claims with reasonable certainty because of the highly subjective nature of creating an abstraction of a storage protocol. Given the numerous design choices and competing design tradeoffs involved in simplifying or generalizing a storage protocol, a POSITA would not be able to determine with reasonable certainty whether they have implemented an abstraction protocol because the claims, specification, and prosecution history provide no objective criteria to determine whether a storage protocol has been sufficiently simplified or generalized to constitute the claimed abstraction protocol. As one example, the specification makes clear that "[t]he simplified abstraction protocol provides high-level access commands to storage media devices." '767 pat., 4:4-6. However, there is no objective standard for determining whether commands are high-level as opposed to not high-level (the specification is silent as to what to call a non-high-level command). The specification's incomplete example does not fill this void. *See*, *id.* at 4:6-10 ("A high-level command may ultimately resolve to several commands at the SATA or SAS interface, allowing the host to issue and track fewer commands. An example of which is moving a larger amount of data with one command than the SATA or SAS protocols support natively.").

VI. "Storage Media Device Interface" (Claims 1 and 16)

25. Independent claims 1 and 16 each recite a "storage media device interface." The portions of claim 1 reciting the term are representative and reproduced below:

> 1. A routable packet-switched network supported by an abstraction protocol comprising: …
>
> a master controller, … , a master controller interface to communicate with the host, and at least one master controller control link interface; and
>
> at least one edge controller, … , an edge controller control link interface to communicate with the master controller via the master controller control link interface, and at least one *storage media device interface* to communicate with at least one storage media device …

26. The plain and ordinary meaning of storage media device interface is a physical interface for transmitting and receiving commands and data between the edge controller and the storage media device.

27. Claims 1 and 16 recite a number of different interfaces. In both claims, the storage media device interface is the only recited interface used to communicate with a storage media device. This is consistent with the term's plain and ordinary meaning because the recitation of "storage media device" is used as a modifier or qualifier of "interface."

Claim 1	Claim 16
"a master controller interface to communicate with the host" (*id.*, 12:37-38) "at least one master controller link interface" (*id.*, 12:38-39) "an edge controller control link interface to communicate with the master controller via the master controller control link interface" (*id.*, 12:41-44)	"a first master controller interface to communicate with the host, and at least one first master controller control link interface" (*id.*, 14:5-8) "a first edge controller control link interface to communicate with the first master controller via the first master controller control link interface" (*id.*, 14:11-13) "a second master controller interface to communicate with the first edge processing element, and at least one second master

"at least one storage media device interface to communicate with at least one storage media device" (*id.*, 12:44-45)	controller control link interface to communicate with a second edge controller" (*id.*, 14:15-19) "a second edge controller control link interface allowing said second edge processing element to communicate with the second master controller" (*id.*, 14:21-24) "at least one storage media device interface to communicate with at least one storage media device" (*id.*, 14:25-26)

28. In the specification, a storage media device interface is the only described interface for connecting an edge controller to a storage media device. Figures 4A and 4C depict storage media device interfaces that directly connect the edge controller to the storage media devices, with no other interface between them. '767 pat., Figs. 4A & 4C. Figure 4A depicts an edge controller that contains "one or more [storage media device] interfaces 418 & 420 which communicate with one or more [storage media devices] 422 & 424 via SATA and/or SAS links 426 and 428." *Id.*, 5:31-32, 5:38-40.

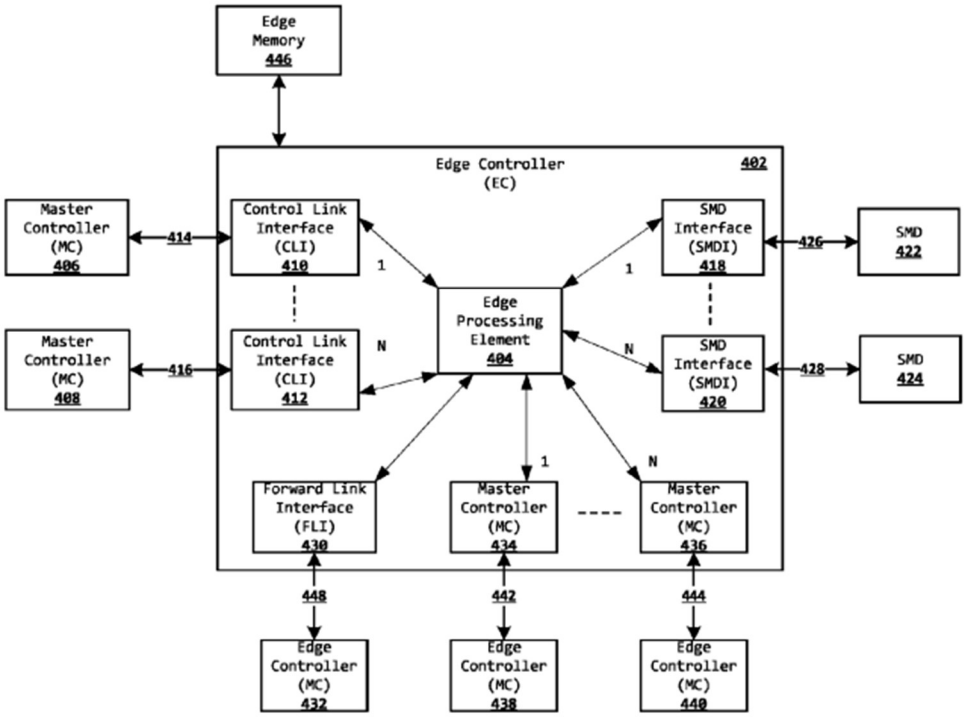


FIG. 4A

Figure 4C is another depiction of an edge controller that has the same arrangement. *Id.*, Fig. 4C, 6:33-35 ("one or more SMD interfaces 418' & 420' which communicate with one or more SMDs 422' & 424' via SATA and/or SAS links 426' and 428'"). It is clear from both figures and the accompanying description that the storage media device interfaces provide direct communication between an edge controller and connected storage media devices.

29. My opinion is also supported by extrinsic evidence. Numerous dictionaries define an "interface" as a structure that connects two objects. For example, the *Dictionary of Computer and Internet Terms* defines "interface" as "the connection between two systems through which information is exchanged." AMD-CV-0008711-13. The *Dictionary of Computer Networking* defines "interface" as "[t]he point at which a connection is made between two hardware devices[.]" AMD-CV-0008717-20. The *Webster's New World Telecom Dictionary* defines

"interface" as "[t]he device or component that serves to physically and logically interconnect two other devices or systems and that enables their interoperation." AMD-CV-0008741-43.

Source	Definition
Definition of "interface," Dictionary of Computer and Internet Terms AMD-CV-0008711-13	"[T]he connection between two systems through which information is exchanged. For example, in computer hardware, an interface is an electrical connection of the proper type. In software, it is a standard format for exchanging data."
Definition of "interface," Dictionary of Computer Networking AMD-CV-0008717-20	"The point at which a connection is made between two hardware devices, between a user and a program or operating system, or between two applications. In hardware, an interface describes the logical and physical connections, as in RS-232-C, and is often considered synonymous with the term port. A user interface consists of the means by which a program communicates with the user, including a command line, menus, dialog boxes, online help systems, and so on. User interfaces can be classified as character based, menu-driven, or graphical. Software interfaces are Application Programming Interfaces (APls) and consist of the codes and messages used by programs to communicate behind the scenes."
Definition of "interface," Minoli-Cordovana's Authoritative Computer & Network Security Dictionary AMD-CV-0008731-33	"An architectural concept that provides interconnection between physical blocks at reference points."
Definition of "interface," Webster's New World Telecom Dictionary AMD-CV-0008741-43 (citations omitted)	"2. The device or component that serves to physically and logically interconnect two other devices or systems and that enables their interoperation. Such an interface may comprise a combination of hardware and firmware. … 3. Software that logically interconnects two computers or a computer and another device and allows them to interoperate. Such software generally is characterized as performing a gateway function. …"

30. It is my opinion that Plaintiffs' construction ("[p]lain and ordinary meaning, that is 'interface that allows communication with at least one storage media device'") is not correct

because it fails to address the distinction between a storage media device interface and the other claimed interfaces.

31. The '767 patent states that its invention involves simplifying the host (e.g., the computer) that accesses storage media devices by abstracting storage protocols and pushing storage media storage media device interfaces to the edge (e.g., edge controller):

> This invention simplifies a host that accesses SATA and SAS storage media devices by abstracting the SATA and SAS protocols with one full duplex protocol that supports full command queuing to each storage media device, whether SATA or SAS. … The storage media devices' SATA or SAS interfaces are pushed to the edge, away from the host and toward the storage media device for which it supports. Pushing the SAS/SATA protocol to the edge simplifies the host/controller since it does not implement the legacy SAS/SATA protocol, it can do what fits its application best. Because SAS/SATA are pushed to the edge and abstracted to the host, SATA and SAS can be comingled without impacting the host (host is SAS/SATA-agnostic).

Id., 3:65-4:19.

32. For example, in the routable packet-switched network of claim 1, a host may issue a storage command to the master controller. For the storage command to be received by the master controller, the storage command must pass through a master controller interface because the claim states that the master controller interface is the structure used to communicate with the host. *Id.*, 12:37-38 ("a master controller interface to communicate with the host"). For the storage command to reach a storage media device, the storage command must be communicated to an edge controller because the edge controller is the only structure that the claim states can communicate with a storage media device. *Id.*, 12:40-45 ("the edge controller comprising… at least one storage media device interface to communicate with at least one storage media device"). This means that, for the storage command to be received by the edge controller, the storage command must pass through a master controller control link interface and an edge

controller control link interface because the claim states those interfaces are used for communication between the master controller and the edge controller. *Id.*, 12:41-44 ("an edge controller control link interface to communicate with the master controller via the master controller control link interface"). Therefore, at a minimum, a storage command from the host must pass through at least one master controller and one edge controller, and in doing so, the storage command must pass through several different interfaces (e.g., master controller interface, a master controller control link interface, and an edge controller control link interface) before it reaches the storage media device interface. And yet, under Plaintiffs' construction, each of those interfaces must also be a storage media device interface because each of those interfaces is an "interface that allows communication with at least one storage media device."

VII. Materials Considered

33. In reaching the opinions expressed in this Declaration, I have reviewed and considered the materials cited in this Declaration, including the '767 patent and the prosecution history of the '767 patent. I have also reviewed excerpts from the Dictionary of Computing Networking, Dictionary of Computing, Newton's Telecom Dictionary, Minoli-Cordovana's Authoritative Computer & Network Security Dictionary, Modern Dictionary of Electronics, Microsoft Computer Dictionary, Dictionary of Computer and Internet Terms, and Webster's New World Telecom Dictionary that include definitions of "abstraction," "protocol," and "interface." AMD-CV-0008714-16; AMD-CV-0008721-23; AMD-CV-0008734-37; AMD-CV-0008728-30; CV-AMD0017608-23; CV-AMD0017595-607; AMD-CV-0008711-13; AMD-CV-0008717-20; AMD-CV-0008731-33; AMD-CV-0008741-43. I have further reviewed excerpts from "Is Abstraction the Key to Computing?" by Jeff Kramer. AMD-CV-0008990-95.

VIII. Legal Principles

34. 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:

35. 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.

36. 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.

37. 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.

38. 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."

39. 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.

40. 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.

41. 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.

42. I understand that "[a]n element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure,

material, or acts described in the specification and equivalents thereof." 35 U.S.C. § 112(f). I further understand that the means-plus-function analysis contains two steps: the first step is to determine whether the claim limitation is drafted in a means-plus-function format, meaning whether the claim limitation connotes sufficiently definite structure to a person of ordinary skill in the art. The second step is to identify the claimed function and determine whether the specification discloses sufficient structure corresponds to the claimed function.

43. I understand that for the first step, the test is not to determine whether the limitation is "essentially…devoid of anything that can be construed as structure." Rather, the test is whether the limitation connotes *sufficient* structure to a person of ordinary skill in the art. I understand that the Court would first look to intrinsic evidence, and then, if necessary, to the extrinsic evidence. For the second step, it is not enough if the specification simply lists a certain structure—that structure must be "clearly linked to a claimed function in order to be a corresponding structure for that function."

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 21, 2025, at Beaverton, Oregon.

Darrell Long

DARRELL LONG

ATTACHMENT A

Cumulative Biobibliography
University of California, Santa Cruz

April 27, 2024

DARRELL DON EARL LONG

Distinguished Research Professor of Engineering
Kumar Malavalli Endowed Chair Professor in Storage Systems Research, Emeritus

Employment History

2024–	Distinguished Visiting Scholar, Santa Clara University
2023–	Distinguished Research Professor of Engineering, University of California, Santa Cruz
	Distinguished Professor of Engineering, *Emeritus*, University of California, Santa Cruz
2019–23	Director, Center for Research Systems & Storage, University of California, Santa Cruz
2017–23	Distinguished Professor of Engineering, University of California, Santa Cruz
2005–23	Kumar Malavalli Endowed Chair Professor in Storage Systems Research
2004–10	Associate Dean for Research and Graduate Studies, Jack Baskin School of Engineering, University of California, Santa Cruz
2001–19	Director, Storage Systems Research Center, University of California, Santa Cruz
1999–17	Professor, Computer Science, University of California, Santa Cruz
1998–01	Associate Dean, Jack Baskin School of Engineering, University of California, Santa Cruz
1994–99	Associate Professor, Computer Science, University of California, Santa Cruz
1988–94	Assistant Professor, Computer Science, University of California, Santa Cruz
1986–88	Research Assistant, Computer Science & Engineering, University of California, San Diego
1985–87	Teaching Associate, Computer Science & Engineering, University of California, San Diego
1984–87	Lecturer in Mathematics, Department of Mathematical Sciences, San Diego State University
1981–84	Systems Programmer, University Computer Center, San Diego State University

Visitor History

2019 (Winter)	Professeur Invité, Sorbonne Université
2016–	Associate Member, European Organization for Nuclear Research (CERN)
2016 (Fall)	Professeur Invité, Conservatoire National des Arts et Métiers
2014–2020	Visiting Scientist, Lawrence Livermore National Laboratory
2014 (Fall)	Professeur Invité, Conservatoire National des Arts et Métiers
	Professeur Invité, Université Paris–Descartes

2013 (Winter)	Professeur Invité, Conservatoire National des Arts et Métiers
	Professeur Invité, Université Paris–Descartes
	Professeur Invité, Université Paris–Dauphine
2012–2014	Visiting Professor, United States Naval Postgraduate School
2011 (Winter)	Professeur Invité, Conservatoire National des Arts et Métiers
2010 (Winter)	Professeur Invité, Université Paris–Dauphine
2009 (Winter)	Professeur Invité, Université Paris–Dauphine
2008 (Winter)	Visiting Professor, University of Technology, Sydney
2007 (Winter)	Visiting Scholar, University of California, San Diego
	Visiting Scholar, Center for Communications Research
1995–2011	Visiting Scientist, IBM Almaden Research Center

Education

Ph.D.	1988	University of California, San Diego, Computer Science
M.S.	1986	University of California, San Diego, Computer Science
B.S.	1984	San Diego State University, Computer Science

Honors and Awards

2018	IBM Faculty Award
2016	Best Paper Award, "RESAR: Reliable Storage at Exabyte Scale," *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems*
2015	Best Paper Award, "Classifying Data to Reduce Long Term Data Movement in Shingled Write Disks," *Conference on Mass Storage Systems and Technologies*
2013	Best Short Paper Award, "A File By Any Other Name: Managing File Names with Metadata," *International Systems and Storage Conference*
2012	Certificate of Appreciation for Outstanding Service, National Research Council
	IEEE Certificate of Appreciation
2011	Chancellor's Achievement Award for Diversity
2010	Professor *ad Honorem* de la Universidad Católica del Uruguay
2008	Fellow, American Association for the Advancement of Science
	Certificate of Appreciation for Outstanding Service, National Research Council
2006	Fellow, Institute of Electrical and Electronics Engineers
2005	Kumar Malavalli Endowed Chair in Storage Systems Research
	IBM Research Invention Achievement Award (Third Plateau)
	Certificate of Appreciation for Outstanding Service, National Research Council

2003 IBM Faculty Award

2002 IBM Research Invention Achievement Award (Second Plateau)

IEEE Computer Society Certificate of Appreciation

2001 IBM Corporate Accomplishment Award for Adaptive Differential Back-up in the Tivoli Storage Manager

1997 IBM Research Invention Achievement Award (First Plateau)

1996 IBM Research Invention Achievement Award

IEEE Computer Society Certificate of Appreciation

1995 Honorable mention, 1994–95 Excellence in Teaching Award

Best Paper Award, "A Longitudinal Study of Internet Host Reliability," *Symposium on Reliable Distributed Systems*

1994 Senior Member, Institute of Electrical and Electronics Engineers

1993 IEEE Computer Society Certificate of Appreciation

1992 Regents Junior Faculty Fellow

1991 Student Alumni Council Favorite Professor Award

1989 Regents Junior Faculty Fellow

1988 Regents Junior Faculty Fellow

Grants

2022–25 *Trust Worthy Information Storage Technology Enhanced Devices (TWISTED)*, Defense Advanced Research Projects Agency (DARPA), Phase 2: $2,500,000 (with P. Alvaro). **Panel Reviewed**.

2020–21 *Trust Worthy Information Storage Technology Enhanced Devices (TWISTED)*, Defense Advanced Research Projects Agency (DARPA), Phase 1: $225,000. **Panel Reviewed**.

2019–24 *Phase II I/UCRC CRSS*: *Center for Research in Storage Systems*, National Science Foundation, $500,000. **Peer Reviewed**.

2018–21 *A Multi-Layered Deniable Steganographic File System*, National Science Foundation, $500,000. **Peer Reviewed**.

2017–20 *Integrated End-to-end Performance Prediction and Diagnosis for Extreme Scientific Workflows*, Department of Energy, Office of Science, $300,000. **Panel Reviewed**.

2015–17 *Automatic Tuning and Contention Management for Lustre*, Intel Corporation, $187,024. **Panel Reviewed**.

2015–18 *Automatic Storage and Network Contention Management for Large-scale High-Performance Computing Systems*, National Science Foundation, $450,000. **Peer Reviewed**.

2013–18 *I/UCRC: A Single-Site I/UCRC Center for Research in Storage Systems*, National Science Foundation, $468,850 (with E. Miller). **Peer Reviewed**.

2012–13 *Better File System Management Through Rich Metadata and Provenance*, NASA, $40,000. **Panel Reviewed**.

2012–15 RESAR: *Robust, Efficient, Scalable, Autonomous Reliable Storage for the Cloud*, National Science Foundation, $374,700. **Peer Reviewed**.

2011–12 *Reducing Fragmentation in Deduplicated Storage Systems*, Hewlett-Packard Laboratories, $50,000. **Panel Reviewed**.

Better File System Management Through Rich Metadata and Provenance, NASA, $40,000. **Panel Reviewed**.

Improving Automated Metadata Extraction, Analysis and Reporting, United States Navy, $150,000. **Panel Reviewed**.

2010–11 *Metadata Exploration in Digital Forensics*, United States Navy, $196,156. **Panel Reviewed**.

2010–13 *Dynamic Non-Hierarchical File Systems for Exascale Storage*, Department of Energy, Office of Science, $1,462,106. **Peer Reviewed**.

2010–13 *LockBox*: *Enabling Users to Keep Data Safe*, National Science Foundation, $499,907 (with E. Miller). **Peer Reviewed**.

2009–14 *Collaborative Research*: *A Multi-University I/UCRC Center on Intelligent Storage*, National Science Foundation, $275,000 (with E. Miller). **Peer Reviewed**.

2009–12 *Scalable Data Management Using Metadata and Provenance*, National Science Foundation, $553,000 (with E. Miller, in collaboration with Margo Seltzer, Harvard University). **Peer Reviewed**.

2010–11 *Trading Storage for Computation*, NASA, $61,000. **Panel Reviewed**.

2009–10 *Development of a Collaborative Project for Remotely Sensed Science and Technology*, NASA, $300,000 (with Raphael Kudela, Ethan Miller, Roberto Manduci, Donald Potts, Eli Silver, Michael Loik and Chris Wilmers). **Panel Reviewed**.

2007 *ViewFS: Dynamic Name-Spaces for Metadata-Rich File Systems*, Lawrence Livermore National Laboratory, $74,994 (with E. Miller). **Panel Reviewed**.

2006–09 *End-to-End Performance Management for Large Distributed Storage*, National Science Foundation, $956,647 (with S. Brandt). **Peer Reviewed**.

2006–11 *Petascale Data Storage Institute*, Department of Energy, Office of Science, $11,250,000 (in collaboration with Carnegie-Mellon University, University of Michigan, and the Department of Energy National Laboratories). **Peer Reviewed**.

2005–10 *Institute for Scalable Scientific Data Management*, Department of Energy, Los Alamos National Laboratory, $4,750,000 (with S. Brandt and E. Miller). **Panel Reviewed**.

2005–06 *Scalable File Systems for High Performance Computing*, Department of Energy, Defense Programs Laboratories, $250,000 (with S. Brandt, E. Miller, M. Abadi and C. Maltzahn). **Peer Reviewed**.

2003 *A Scalable On-Line Associative Deep Store*, University of California, Microelectronics Electronics Innovation and Computer Research Opportunities Program (MICRO), $27,000. **Panel Reviewed**.

2003–06 *A Scalable On-Line Associative Deep Store*, National Science Foundation, $294,012. **Peer Reviewed**.

2002–07 *Applications of Data Grouping for Effective Mobility*, National Science Foundation, $338,130. **Peer Reviewed**.

2002–05 *Scalable File Systems for High Performance Computing*, Department of Energy, Defense Programs Laboratories, $900,000 (with S. Brandt, E. Miller and K. Obraczka). **Panel Reviewed**.

2001–02 *Building a High-Performance Storage Systems from Commodity Components,* Department of Energy, Lawrence Livermore National Laboratory, $65,000. **Panel Reviewed**.

2000–01 *Application of Probe-based Storage to High Performance Computing,* Department of Energy, Lawrence Livermore National Laboratory, $39,239. **Panel Reviewed**.

2000–03 *Architectures and Algorithms to Exploit Probe-Based Storage,* National Science Foundation, $345,191 (with S. Brandt and T. Madhyastha). **Peer Reviewed**.

2000–02 *An Experimental Study of Broadcasting Protocols for Video-on-Demand,* National Science Foundation, $100,000. **Peer Reviewed**.

1999–01 *High Performance Integration of Advanced Tertiary Stores,* National Science Foundation, $170,353. **Peer Reviewed**.

1998 *Real-Time Environmental Information Network and Analysis System* (REINAS), Office of Naval Research, $100,000. **Panel Reviewed**.

1998–99 *Tactical Environmental Data System/Real-time* (TEDS/RT), Naval Research Laboratory, $75,000. **Panel Reviewed**

1997–02 *National Partnership for Advanced Computing Infrastructure* (NPACI), National Science Foundation, $819,000 (with P. Mantey, A. Pang and S. Flatté). **Panel Reviewed**.

1997–99 *Predictive Power Conservation,* National Science Foundation, $122,011 (with D. Helmbold). **Peer Reviewed**.

1997–99 *Improving Cache Performance by Predicting I/O System Actions,* National Science Foundation, $136,647. **Peer Reviewed**.

1996–97 *Efficient Back-up and Restore Using Differential Files,* International Business Machines Corporation, $79,864.

1995–98 *Instant Infrastructure and Distributed Resource Management,* Office of Naval Research, $90,911. **Panel Reviewed**.

1995–96 *Efficient Resource Utilization Through Idle-Time Prediction,* University of California Seed Funds, $15,000 (with D. Helmbold).

1993–94 *Global-scale Distributed Data Base Management,* Academic Senate Committee on Research, $1,500.

1993–95 *Integration of Heterogeneous Real-time Data Repositories for Scientific Use,* Office of Naval Research, $219,164. **Panel Reviewed**.

1992–93 *Estimating Host Reliability Using the Internet,* University of California, Microelectronics Electronics Innovation and Computer Research Opportunities Program (MICRO), $5,481. **Panel Reviewed**.

1992 University of California, Regents Junior Faculty Fellowship, $700.

1992–97 *Real-time Environmental Information Network and Analysis System* (REINAS), Office of Naval Research, $4,767,112 (with P. Mantey *et al.*). **Peer Reviewed**.

1992–93 University of California, Regents Junior Faculty Fellowship, $750.

1992–93 *Estimating Reliability Using the Internet,* University of California Seed Funds, $10,000.

1992–93 *Estimating Host Reliability Using the Internet,* Sun Microsystems, Incorporated, $16,590. **Panel Reviewed**.

1991–92 *A Distributed Architecture for High-speed I/O,* Department of Energy, Lawrence Livermore National Laboratory, $15,183. **Panel Reviewed**.

1991–93 *High-speed Distributed Storage Management,* National Science Foundation, $68,955. **Peer Reviewed**.

1991–92 *A High-speed System to Support Multimedia,* Academic Senate Committee on Research, $1,500.

1991–92 *Instructional Improvement Grant,* Academic Senate Committee on Teaching, $200.

1990–91 *Concurrent Systems Laboratory,* University of California Seed Funds, $12,500.

1989–90 *Fault-tolerant Operating System Techniques,* University of California, Microelectronics Electronics Innovation and Computer Research Opportunities Program, (MICRO) $4,000. **Panel Reviewed**.

1989 University of California, Regents Junior Faculty Fellowship, $500.

1988–89 *Modeling Fault-tolerant Computations,* Academic Senate Committee on Research, $1,500.

1988 University of California, Regents Junior Faculty Fellowship, $1,000.

Scholarly and Creative Work

Books

1. Ruth A. David, Steven R.J. Brueck, Stephen W. Drew, Alan H. Epstein, Robert A. Furman, Sharon Glotzer, Christopher C. Green, Diane E. Griffin, J. Jerome Holton, Michael R. Ladisch, Darrell Long, Frederick R. Lopez, Richard M. Osgood, Stewart D. Personick, Alton D. Romig, S. Shankar Sasrty, James B. Smith, Camillo J. Taylor and Diane Wiley. *Avoiding Surprise in an Era of Global Technology Advances.* National Research Council, National Academies Press, 2005. **Peer Reviewed**.

2. John L. Carroll and Darrell D. E. Long. *Theory of Finite Automata.* Englewood Cliffs, New Jersey: Prentice-Hall, 1989. **Editorial Review**.

Chapters in Books

1. Ismail Ari, Ahmed Amer, Ethan L. Miller, Robert Gramacy, Scott A. Brandt and Darrell D. E. Long. "ACME: Adaptive Caching using Multiple Experts," *Distributed Data & Structures 4* (Proceedings in Informatics 14), W. Litwin and G. Lèvy, Eds. Paris, France: Carleton Scientific, March 2002, pp. 143–158. **Peer Reviewed**.

2. Steven W. Carter, Darrell D. E. Long and Jehan-François Pâris. "Video-on-Demand Broadcasting Protocols," *Multimedia Communications: Directions and Innovations,* J. D. Gibson, Ed. San Diego: Academic Press, 2000, pp. 179–189. **Peer Reviewed**.

3. Richard A. Golding and Darrell D. E. Long. "Simulation Modeling of Weak-Consistency Protocols," *Network Systems Design,* E. Gelenbe, K. Bagchi and G. Zobrist, Eds. Gordon and Breach Science Publishers, 1999, pp. 161–186. **Invited**, **Peer Reviewed**.

4. Darrell D. E. Long and John L. Carroll. "Using Simulation to Evaluate Consistency Protocols for Replicated Data," *Progress in Simulation II,* G. W. Zobrist and J. V. Leonard, Eds. Ablex Publishing, 1995. **Invited**, **Peer Reviewed**.

Peer Reviewed Journals

1. Liangkang Zhang, Yulai Xie, Minpeng Jin, Pan Zhou, Gongming Xu, Yafeng Wu, Dan Feng, Dan and Darrell Long. "A Novel Hybrid Model for Docker Container Workload Prediction," *IEEE Transactions on Network and Service Management, to appear.*

2. Yafeng Wu, Yulai Xie, Xuelong Liao, Pan Zhou, Dan Feng, Lin Wu, Xuan Li, Wildani, Avani and Darrell Long. "Paradise: Real-time, Generalized, and Distributed Provenance-Based Intrusion Detection," *ACM Transactions on Dependable and Secure Computing, to appear.*

3. Daniel Bittman, Peter Alvaro, Pankaj Mehra, Darrell D. E. Long and Ethan L. Miller. "Twizzler: A Data-centric OS for Non-volatile Memory," *ACM Transactions on Storage*, vol. 17, no. 2, June 2021.

4. Austen Barker, Yash Gupta, James Hughes, Ethan L. Miller and Darrell D. E. Long. "Rethinking the Adversary and Operational Characteristics of Deniable Storage," *Journal Journal of Surveillance, Security and Safety*, vol. 2, May 27, 2021.

5. Yulai Xie, Minpeng Jin, Zhuping Zou, Gongming Xu, Dan Feng, Wenmao Liu and Darrell Long. "Real-time Prediction of Docker Container Resource Load Based on A Hybrid Model of ARIMA and Triple Exponential Smoothing," *IEEE Transactions on Cloud Computing*, April 22, 2020.

6. Yulai Xie, Yafeng Wu, Dan Feng and Darrell Long. "P-Gaussian: Provenance-Based Gaussian Distribution for Detecting Intrusion Behavior Variants Using High Efficient and Real Time Memory Databases," *IEEE Transactions on Dependable and Secure Computing*, December 17, 2019.

7. Yulai Xie, Zhuping Zhou, Kai Huang, Gongming Xu, Dan Feng and Darrell Long. "A Docker Container Anomaly Monitoring System Based on Optimized Isolation Forest," *IEEE Transactions on Cloud Computing*, September, 2018.

8. Die Hu, Dan Feng, Yulai Xie, Gongming Xu, Xinrui Gu and Darrell Long. "Efficient Provenance Management via Clustering and Hybrid Storage in Big Data Environments," *IEEE Transactions on Big Data*, December 2020, vo. 6, no. 4, pp. 792–803.

9. Yulai Xie, Dan Feng, Yuchong Hu, Yan Li, Staunton Sample and Darrell Long. "Pagoda: A Hybrid Approach to Enable Efficient Real-time Provenance Based Intrusion Detection in Big Data Environments," *IEEE Transactions on Dependable and Secure Computing*, August 29, 2018.

10. Stephanie N. Jones, Ahmed Amer, Ethan L. Miller, Darrell D. E. Long, Rekha Pitchumani and Christina R. Strong. "Classifying Data to Reduce Long-Term Data Movement in Shingled Write Disks," *ACM Transactions on Storage*, vol. 12 no. 1, February 2016.

11. Yulai Xie, Dan Feng, Yan Li and Darrell D. E. Long. "Oasis: an Active Storage Framework for Object Storage Platform," *Future Generation Computer Systems*, vol. 56, March 2016, pp. 746–758.

12. Nicolás López, Matías Rodríguez, Catalina Fellegi, Darrell Long and Thomas Schwarz, S.J. "Even or Odd: A Simple Graphical Authentication System (*Par o Impar*: *un sistema gráfico simple de autenticación*)," *IEEE Latin America Transactions* (Revista IEEE América Latina), 13(3), pp. 804–809, March 2015.

13. Yulai Xie, Kiran-Kumar Muniswamy-Reddy, Dan Feng, Yan Li and Darrell D. E. Long. "Evaluation of a Hybrid Approach for Efficient Provenance Storage," *ACM Transactions on Storage*, vol. 9 no. 4, November 2013.

14. Witold Litwin, Darrell Long and Thomas Schwarz. "Combining Chunk Boundary and Chunk Signature Calculations for Deduplication (*Combinar la calculacion de limites de trozos y de firmas de trozos para deduplicacion*)," *IEEE Latin America Transactions* (Revista IEEE América Latina), 10(1), pp. 1305–1311, January 2012.

15. Ahmed Amer, JoAnne Holliday, Darrell D. E. Long, Ethan L. Miller, Jehan-François Pâris and Thomas Schwarz, S.J. "Data Management and Layout for Shingled Magnetic Recording," *IEEE Transactions on Magnetics*, vol. 47, no. 10, pp. 3691–3697, October 2011.

16. Lawrence L. You, Kristal T. Pollack, Darrell D. E. Long and K. Gopinath. "PRESIDIO: A Framework for Efficient Archival Data Storage," *ACM Transactions on Storage*, vol. 7, no. 2, art. 6, pp. 1–60, July 2011.

17. Bo Hong, Scott A. Brandt, Darrell D. E. Long, Ethan L. Miller and Ying Lin. "Using MEMS-Based Storage in Computer Systems – Device Modeling and Management," *ACM Transactions on Storage*, vol. 2, no. 2, May 2006, pp. 139–160.

18. Bo Hong, Feng Wang, Scott A. Brandt, Darrell D. E. Long and Thomas J. E. Schwarz, S.J. "Using MEMS-Based Storage in Computer Systems – MEMS Storage Architectures," *ACM Transactions on Storage*, vol. 2, no. 1, February 2006, pp. 1–21.

19. Randal Burns, Larry Stockmeyer and Darrell Long. "In-Place Reconstruction of Version Differences," *IEEE Transactions on Knowledge and Data Engineering*, vol. 15, no. 4, July 2003, pp. 973–984.

20. Miklós Ajtai, Randal Burns, Ronald Fagin, Darrell Long and Larry Stockmeyer. "Compactly Encoding Unstructured Inputs with Differential Compression," *Journal of the ACM*, vol. 49, no. 3, May 2002, pp. 318–367.

21. Randal C. Burns, Robert M. Rees and Darrell D. E. Long. "Efficient Data Distribution in a Web Server Farm," *IEEE Internet Computing*, vol. 5, no. 4, July 2001, pp. 56–65.

22. Randal C. Burns, Robert M. Rees, Larry Stockmeyer, and Darrell D. E. Long. "Scalable Session Locking for a Distributed File System," *Cluster Computing Journal*, Kluwer Academic Publishers, vol. 4, no. 4, October 2001, pp. 295–306.

23. David P. Helmbold, Darrell D. E. Long, Tracey L. Sconyers and Bruce Sherrod. "Adaptive Disk Spin-Down for Mobile Computers," *ACM/Baltzer Mobile Networks and Applications Journal*, vol. 5, no. 4 (2000), pp. 285–297.

24. Benjamin C. Reed, Darrell D. E. Long, Edward G. Chron and Randal C. Burns. "Authenticating Network Attached Storage," *IEEE Micro*, vol. 20, no. 1, January 2000, pp. 49–57.

25. Steven W. Carter and Darrell D. E. Long. "Improving Bandwidth Efficiency of Video-on-Demand Servers," *Computer Networks*, Elsevier, vol. 31, nos. 1–2, January 1999, pp. 99–111.

26. Eric C. Rosen, Theodore R. Haining, Darrell D. E. Long, Patrick E. Mantey. "REINAS: A Real-time System for Managing Environmental Data," *Journal of Software Engineering and Knowledge Engineering*, vol. 8, no. 1 (1998), pp. 35–53.

27. Darrell D. E. Long, Bruce R. Montague and Luis-Felipe Cabrera. "Swift/RAID: A Distributed RAID System," *Computing Systems*, vol. 7, no. 3 (1994), pp. 333–359.

28. Ivan Fellner, Ivan Racko, Milos Racek, Karol Fabian and Darrell D. E. Long. "A Comparison of Two Implementations of the Token Ring Priority Function," *International Journal in Computer Simulation*, vol. 5, no. 1 (1994), pp. 13–28.

29. Luis-Felipe Cabrera and Darrell D. E. Long. "Swift: Using Distributed Disk Striping to Provide High I/O Data Rates," *Computing Systems*, vol. 4, no. 4 (1991), pp. 405–436.

30. Richard A. Golding and Darrell D. E. Long. "Accessing Replicated Data in a Large-Scale Distributed System," *International Journal in Computer Simulation*, vol. 1, no. 4 (1991), pp. 347–372.

31. Jehan-François Pâris and Darrell D. E. Long. "The Performance of Available Copy Protocols for the Management of Replicated Data," *Performance Evaluation*, vol. 11, no. 1, April 1990, pp. 9–30.

32. Darrell D. E. Long, John L. Carroll and Kris Stewart. "Estimating the Reliability of Regeneration-Based Replica Control Protocols," *IEEE Transactions on Computers*, vol. 38, no. 12, (December 1989), pp. 1691–1702.

Peer Reviewed Conference Papers

1. Eugene Chou, Leo Conrad-Shah, Austen Barker, Andrew Quinn, Ethan L. Miller and Darrell D. E. Long. "Lethe: Secure Deletion by Addition," *Proceedings of the Workshop on Challenges and Opportunities of Efficient and Performant Storage Systems* (CHEOPS), Rome, ACM: Mary 8, 2023.

2. Kyle Fredrickson, Austen Barker and Darrell Long. "A Multiple Snapshot Attack on Deniable Storage Systems," *Proceedings of the Twenty-ninth International Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS 2021), IEEE, November 3–5, 2021.

3. Oceane Bel, Kenneth Chang, Nathan R. Tallent, Dirk Duellmann, Ethan L. Miller, Faisal Nawab and Darrell D. E. Long. "Geomancy: Automated Performance Enhancement through Data Layout Optimization," *Proceedings of the Conference on Mass Storage Systems and Technologies* (MSST), Santa Clara University: IEEE, October 26–30, 2020.

4. James Byron, Ethan L. Miller and Darrell D. E. Long. "Measuring the Cost of Reliability in Archival Systems," *Proceedings of the Conference on Mass Storage Systems and Technologies* (MSST), Santa Clara University: IEEE, October 26–30, 2020.

5. Austen Barker, Yash Gupta, Sabrina Au, Eugene Chou, Ethan L. Miller and Darrell D. E. Long. "Artifice: Data in Disguise," *Proceedings of the Conference on Mass Storage Systems and Technologies* (MSST), Santa Clara University: IEEE, October 26–30, 2020.

6. Daniel Bittman, Peter Alvaro, Darrell Long and Ethan Miller. "Twizzler: a Data-Centric OS for Non-Volatile Memory," *Proceedings of the 2020 USENIX Annual Technical Conference,* Boston: Usenix Association, July 15–17, 2020.

7. Daniel Bittman, Peter Alvaro, Darrell D. E. Long and Ethan L. Miller. "A Tale of Two Abstractions: The Case for Object Space," *Proceedings of the Eleventh Hot Topics in Storage and File Systems* (Hot Storage 2019), Renton: Usenix Association, July 8–9, 2019.

8. Daniel Bittman, Darrell D. E. Long, Peter Alvaro, and Ethan L. Miller. "Optimizing Systems for Byte-Addressable NVM by Reducing Bit Flipping," *Proceedings of the Conference on File and Storage Technologies* (FAST), San Jose: Usenix Association, February 25–28, 2019.

9. Sinjoni Mukhopadhyay, Joel Frank, Daniel Bittman, Darrell Long and Ethan Miller. "Efficient Reconstruction Techniques for Disaster Recovery in Secret-Split Datastores," *Proceedings of the Twenty-sixth International Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS 2018), Milwaukee: IEEE, September 25–28, 2018.

10. James Byron, Ethan Miller and Darrell Long. "Using Simulation to Design Scalable and Cost-Efficient Archival Storage Systems," *Proceedings of the Twenty-sixth International Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS 2018), Milwaukee: IEEE, September 25–28, 2018.

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Invited Articles

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2. Randal Burns, Larry Stockmeyer and Darrell D.E. Long. "Experimentally Evaluating In-Place Delta Reconstruction," *Proceedings of the NASA and IEEE Mass Storage Conference,* College Park: IEEE, April 2002, pp. 137–151.

3. Darrell D. E. Long. "A Technique for Managing Mirrored Disks," *Proceedings of the International Performance Conference on Computers and Communication* (IPCCC), Phoenix: IEEE, April 2001, pp. 272–277.

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Miscellanea

1. Daniel Bittman, Peter Alvaro, Darrell D. E. Long and Ethan Miller. "The Flipside: A Bit Flip Saved Is Power and Lifetime Earned," *;login: The Usenix Magazine,* 2019, vol. 44, no. 2.

2. Ahmed Amer, Darrell D. E. Long, Ethan L. Miller, Jehan-Fraçois Pâris and Thomas Schwarz. "Data Management and Layout for Shingled Magnetic Recording," *IEEE International Magnetics Conference* (InterMag 2011), Taipei, Taiwan: IEEE, April 25–29, 2011.

3. K. Gopinath, Jon Elerath and Darrell Long. "Reliability Modelling of Disk Subsystems with Probabilistic Model Checking," *Dagstuhl Seminar on Quantitative and Qualitative Analysis of Network Protocols,* January 2010.

4. António M. Baptista, Michael Wilkin, Phillip Pearson, Paul Turner, Cole M^c^Candlish, Phillip Barrett, Salil Das, Wendy Sommerfield, Ming Qi, Neetu Nangia, David Jay, Darrell Long, Calton Pu, John Hunt, Zhaoqing Yang, Edward Myers, Jeff Darland and Anna Farrenkopf, "Towards a Multipurpose Forecast Systems for the Columbia River Estuary," *Proceedings of the Ocean Community Conference,* Baltimore: Marine Technology Society, November 1998.

5. Benjamin Reed and Darrell D. E. Long, "Analysis of Caching Algorithms for Distributed File Systems," *Operating Systems Review,* July 1996, vol. 30, no. 3, pp. 12–21.

6. Daniel M. Fernandez, Patrick E. Mantey, Darrell D. E. Long, Eric Rosen and Craig M. Wittenbrink. "REINAS: Real-Time Environmental Information Network," *Sea Technology,* May 1996, vol. 37, no. 5, pp. 47–53.

7. Darrell D. E. Long. "A Note On Bit-Mapped Free Sector Management," *Operating Systems Review,* April 1993, vol. 27, no. 2, pp. 7–9.

Patents

1. Darrell D. E. Long and Thomas M. Kroeger. "Predictive Event Tracking Method," U.S. Patent no. 5,889,993, March 1999.

2. Luis Felipe Cabrera and Darrell D. E. Long. "Method and Apparatus for Establishing and Maintaining the Status of Membership Sets used in Mirrored Read and Write Input/Output without Logging," U.S. Patent no. 5,917,998, June 1999.

3. Randal C. Burns, Edward G. Chron, Darrell D. E. Long and Benjamin C. Reed. "Secure Array of Remotely Encrypted Storage Devices," U.S. Patent no. 5,931,947, August 1999.

4. Randal C. Burns and Darrell D. E. Long. "A Method for Generating and Reconstructing In-place Delta Files," U.S. Patent no. 6,018,747, January 2000.

5. Edward G. Chron, Darrell D. E. Long, Randal C. Burns and Benjamin Reed. "Decentralized Remotely Encrypted File System," U.S. Patent no. 6,405,315, June 2002.

6. Randal C. Burns, Robert M. Rees and Darrell D. E. Long. "Data Placement and Allocation using Virtual Contiguity," U.S. Patent no. 6,651,147, November 2003.

7. Randal C. Burns, Robert M. Rees, Darrell D. E. Long and Atul Goel. "Lease-Based Safety Protocol for Distributed System with Multiple Networks," U.S. Patent no. 6,775,703, August 2004.

8. Randal C. Burns and Darrell D. E. Long. "System and Method for Managing Authentication and Coherency in a Storage Area Network," U.S. Patent no. 6,792,424, September 2004.

9. Randal C. Burns, Darrell D. E. Long and Robert M. Rees. "System and Method for Restoring a File System from Backups in the Presence of Deletions," U.S. Patent no. 6,938,056, August 2005.

10. Rajagopal Ananthanarayanan, Ralph Becker-Szendy, Randal C. Burns, Darrell D. E. Long, Jujjuri Venkateswararao, David M. Wolf and Jason C. Young. "Method, System and Computer Program Product for Implementing Copy-on-Write of a File," U.S. Patent no. 7,085,909, August 2006.

11. Jason C. Young, Rajagopal Ananthanarayanan, Randal C. Burns, Darrell D. E. Long, Robert M. Rees, Ralph A. Becker-Szendy, James J. Seeger and David M. Wolf. "Managing File System Versions," U.S. Patent no. 7,139,781, November 2006.

Professional Activities

Invited Lectures

2019 "Geomancy: Automated Performance Enhancement through Data Placement Optimization," IBM Research, Zürich, Organisation Européenne pour la Recherche Nucléaire (CERN), Sorbonne Université.

"Twizzler: An OS for Next-generation Memory Hierarchies," IBM Research, Zürich, Organisation Européenne pour la Recherche Nucléaire (CERN), Sorbonne Université.

2016 "RESAR: Reliable Storage at Exabyte Scale," IBM Research, Zürich, Université Paris–Descartes.

"Pilot: A Framework that Understands How to Do Performance Benchmarks the Right Way," Organisation Européenne pour la Recherche Nucléaire (CERN).

2014 "Horus: Fine-Grained Security for Large-Scale Storage," University of Houston.

"SNQoS: Scalable Shared-Nothing QoS for High-Performance Storage Systems," San Diego State University, University of New Orleans.

"Science and Cyber Security," Lockheed-Martin "Skunk Works" (Advanced Development Programs).

2013 "Horus: Fine-Grained Security for Large-Scale Storage," Laboratoire d'Informatique de Paris 6 (LIP6), Université Pierre et Marie Curie, Conservatoire National des Arts et Métiers, Université de Technologie en Sciences des Organisations et de la Décision de Paris–Dauphine.

"RESAR Storage: a System for Two-Failure Tolerant, Self-Adjusting Million Disk Storage Cluster," Conservatoire National des Arts et Métiers, Université Paris–Descartes, Université Pierre et Marie Curie (Laboratoire d'Informatique de Paris 6).

2012 "RESAR Storage: a System for Two-Failure Tolerant, Self-Adjusting Million Disk Storage Cluster," University of Oregon.

2011 "Science of Cyber Security," Sandia National Laboratories.

2010 "Scalable, Parallel Deduplication for Large Scale Data Systems," Pacific Northwest National Laboratory.

"Extreme Binning: Scalable, Parallel Deduplication for Chunk-based File Backup," Université de Technologie en Sciences des Organisations et de la Décision de Paris–Dauphine.

2009 "Maximizing Efficiency by Trading Storage for Computation," IBM-Amrita Cloud Symposium, Amrita University, Coimbatore, India.

"High-Performance Petascale File Systems," Université de Technologie en Sciences des Organisations et de la Décision de Paris–Dauphine.

"High-Performance Petascale File Systems," Commissariat à l'Energie Atomique, Direction des Applications Militaires et Direction des Ames Nucléaires.

2007 "Ceph: A Scalable, High-Performance Distributed File System," University of Technology, Sydney, Australia.

"Ceph: A Scalable, High-Performance Distributed File System," University of California, San Diego.

2006 "Storage Management – Unchecked Challenges, Untapped Opportunities," Workshop on Distributed Data and Structures, Santa Clara University.

2005 "Storage Management – Unchecked Challenges, Untapped Opportunities," Storage Networking Summit, Bangalore, India.

"Ceph: A Distributed Object-based Storage System," Indian Institute of Science, Bangalore, India.

"Deep Store: Minimum Redundancy Archival Storage," Amrita University, Coimbatore, India.

2004 "Peta-scale Data Storage: Challenges and (a few) Solutions," Yahoo!

"Deep Store," University of Arizona.

"Deep Store," Vrije Universiteit.

2003 "Deep Store: Associative Archival Storage Architecture," Network Appliance.

2002 "Group-based Management of Distributed File Caches," Hewlett-Packard Laboratories.

"Group-based Management of Distributed File Caches," Technische Universität München.

2000 "Perspective on Academic Storage Research," IBM Research.

"Produce-Consumer Locking" and "Analytical Lease Modeling," San Francisco State University.

"The Storage Tank System," Université de technologie en sciences des organisations et de la décision de Paris–Dauphine

1997 "Differential Storage Management" and "Efficient Video-on-Demand Services," Université de technologie en sciences des organisations et de la décision de Paris–Dauphine

"Differential Storage Management," Queen Mary College, University of London.

"A Dynamic Disk Spin-down Technique for Mobile Computing," University of California, Riverside.

"Replication with Minimal Metadata," IBM Corporation.

1996 "Predicting File System Actions from Prior Events," University of California, San Diego.

1995 "Fault-Tolerance in Distributed Systems," WilTel Advanced Technology Group.

1994 "The REINAS System," University of California, Riverside.

1992 "A Study of the Reliability of Internet Sites," San Diego State University.

1991 "Swift – A Distributed Storage System for Multimedia," Matsushita Information Technology Laboratory.

"A Study of the Reliability of Internet Sites," INRIA (Institut National de Recherche en Informatique et Automatique).

"A Study of the Reliability of Internet Sites," University of California, San Diego.

"Swift – A Distributed Storage System for Multimedia," Hewlett-Packard Laboratories.

"Reliable Distributed Storage Systems," Sun Microsystems.

"A Study of the Reliability of Internet Sites," Bay Area Systems Seminar.

1990 "Swift: A Storage Architecture for Very Large Objects," Hewlett-Packard Laboratories.

"Estimating the Reliability of Regeneration-Based Replica Control Protocols," IBM Almaden Research and SRI International.

1989 "Availability and Reliability of Regeneration Protocols for Replicated Objects," Hewlett-Packard Laboratories.

1988 "Optimistic Protocols for Replicated Data Management," Vanderbilt University and Stanford University.

1987 "The Management of Replication in a Distributed Computing System," Georgia Institute of Technology.

"Optimistic Algorithms for Replicated Data Management," Oxford University.

"The Management of Replication: An Overview of the Gemini Project," United States Naval Research Laboratory.

1986 "On Improving the Availability of Replicated Files," University of California, Berkeley.

Conference Organization

2024 General Chair: *Conference on Mass Storage Systems and Technologies* (MSST). Program Committee: *Usenix Technical Conference* (ATC).

2023 Program Committee: *Fourth Joint International Conference on Deep Learning, Big Data and Blockchain* (DBB).

2022 Steering Committee: *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

2021 Steering Committee: *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

2020 Program Chair: *Conference on Mass Storage Systems and Technologies* (MSST).

Program Committee: *Symposium on File and Storage Systems Technology* (FAST), *International Conference on Cloud Computing and Services Science* (CLOSER 2020).

Steering Committee: *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

2019 Program Committee: *IEEE International Conference on Machine Learning and Applications* (ICMLA 2019).

Reviewer: *International Conference on Cloud and Big Data Computing* (CBDC 2019).

Steering Committee: *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

2018 Program Committee: *IEEE Cluster Conference* (Cluster 2018).

Steering Committee: *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

2017 Steering Committee: *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

2016 Program Committee: *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

Steering Committee: *Petascale Data Storage Workshop* (PDSW), *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

2015 Program Committee: *Symposium on File and Storage Systems Technology* (FAST).

Steering Committee: *Petascale Data Storage Workshop* (PDSW), *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

2014 Program Committee: *International Conference on Advanced Communications and Computation* (INFOCOMP), *Conference on Mass Storage Systems and Technologies* (MSST).

General Chair: *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

Steering Committee: *Petascale Data Storage Workshop* (PDSW), *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS), *Symposium on File and Storage Systems Technology* (FAST).

Reviewer: *International Symposium on Performance Analysis of Systems and Software* (ISPASS).

2013 Reviewer: *Electronics and Telecommunications Research Institute Journal* (ETRI), *IEEE Transactions on Neural Networks and Learning Systems, International Workshop on Combinatorial Algorithms.*

Program Committee: *Annual International Systems and Storage Conference* (SYSTOR), *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS), *Conference on Mass Storage Systems and Technologies* (MSST).

Steering Committee: *Petascale Data Storage Workshop* (PDSW), *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS), *Symposium on File and Storage Systems Technology* (FAST).

Advisory Committee: *International Conference on Electronics, Computing and Communication Technologies* (CONECCT).

2012 Steering Committee: *Petascale Data Storage Workshop* (PDSW), *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS), *Symposium on File and Storage Systems Technology* (FAST).

Program Committee: *Symposium on File and Storage Systems Technology* (FAST).

2011 Steering Committee: *Petascale Data Storage Workshop* (PDSW), *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS), *Symposium on File and Storage Systems Technology* (FAST).

Program Committee: *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

2010 Program Chair: *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

Steering Committee: *Petascale Data Storage Workshop* (PDSW), *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS), *Symposium on File and Storage Systems Technology* (FAST).

2009 Program Committee: *International Workshop on Software Support for Portable Storage* (IWSSPS), *Inaugural International Conference on Virtualization and Cloud Computing, Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS), *Petascale Data Storage Workshop* (PDSW).

Program Chair: *Web Information Systems Engineering* (WISE).

General Chair: *Symposium on Applications and the Internet* (SAINT).

Steering Committee: *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS), *Symposium on File and Storage Systems Technology* (FAST).

2008 Program Committee: *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS), *Petascale Data Storage Workshop* (PDSW).

Steering Committee: *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS), *Symposium on File and Storage Systems Technology* (FAST).

2007 Program Committee: *Symposium on File and Storage Systems Technology* (FAST), *Petascale Data Storage Workshop* (PDSW).

Steering Committee: *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS), *Symposium on File and Storage Systems Technology* (FAST).

2006 Program Committee: *International Conference on Dependable Systems and Networks* (DSN), *Dependable Computing and Communications Symposium* (DCCS), *Symposium on Applications and the Internet* (SAINT).

Steering Committee: *Symposium on File and Storage Systems Technology* (FAST), *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

2005 Program Committee: *Symposium on File and Storage Systems Technology* (FAST), *Workshop on Storage Security and Survivability* (StorageSS), *First International Workshop on Software Support for Portable Storage* (IWSSPS).

2004 Program Committee: *Symposium on Applications and the Internet* (SAINT); *SIGMetrics*.

Steering Committee: *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

2003 Program Committee: *Usenix Technical Conference, Symposium on File and Storage Systems Technology* (FAST), *Very Large Data Bases* (VLDB), *International Conference on Distributed Computing Systems* (ICDCS), *IEEE International Performance, Computing, and Communications Conference* (IPCCC), *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

Steering Committee: *Symposium on File and Storage Systems Technology* (FAST), *Workshop on Mobile Computing Systems and Applications* (WMCSA), *IEEE International Performance, Computing, and Communications Conference* (IPCCC), *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

2002 Program Committee: *IEEE International Performance, Computing, and Communications Conference* (IPCCC), *Workshop on Caching, Coherency and Consistency* (WC3), *Workshop on Distributed Data and Structures* (WDAS), *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

Steering Committee: *Symposium on File and Storage Systems Technology* (FAST), *Workshop on Mobile Computing Systems and Applications* (WMCSA), *IEEE International Performance, Computing, and Communications Conference* (IPCCC).

2001 Founding Program Chair: *Symposium on File and Storage Systems Technology* (FAST).

Program Chair: *IEEE International Performance, Computing, and Communications Conference* (IPCCC).

Program Committee: *International Conference on Distributed Computing Systems* (ICDCS).

2000 Program Committee: *Communication Networks and Distributed Systems Modeling and Simulation Conference* (CNDS), *Research Issues in Data Engineering* (RIDE), *Hot Interconnects, Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

Steering Committee: *Workshop on Mobile Computing Systems and Applications* (WMCSA), *Symposium on Applications and the Internet* (SAINT).

1999 General Chair: *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

Program Committee: *Communication Networks and Distributed Systems Modeling and Simulation Conference* (CNDS), *IEEE International Performance, Computing, and Communications Conference* (IPCCC).

Steering Committee: *Symposium on Applications and the Internet* (SAINT).

1998 Program Committee: *Symposium on Reliable Distributed Systems* (SRDS), *Fault Tolerant Computing Systems* (FTCS), *Usenix Technical Conference.*

Steering Committee: *IEEE Workshop on Mobile Computing Systems and Applications* (WMCSA).

Advisory Committee: *Hawaii International Conference on System Sciences* (HICSS).

1997 General Chair: *IEEE Computer Society CompCon.*

Program Committee: *International Conference on Parallel and Distributed Systems* (ICPDS), *Communications Networks and Distributed Systems Modeling and Simulation Conference* (CNDS), *Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

Steering Committee: *Hot Topics in Operating Systems VI* (HotOS).

1996 General Chair: *IEEE Computer Society/National Science Foundation Workshop on Workspaces in the Information Age.*

1996 Program Chair: *IEEE Computer Society CompCon.*

Program Committee: *International Conference on Distributed Computing Systems* (ICDCS), *Annual Simulation Symposium, International Workshop on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

Steering Committee: *Hot Topics in Operating Systems V* (HotOS).

1995 Program Committee: *Symposium on Reliable Distributed Systems* (SRDS), *Usenix Technical Conference, Services in Distributed and Networked Environments* (SDNE), *International Conference on Distributed Computing Systems* (ICDCS), *Annual Simulation Symposium, International Workshop on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

1994 Founding General Chair: *Workshop on Mobile Computing Systems and Applications* (WMCSA).

1994 Program Committee: *Applied Data Bases; First International Workshop on Services in Distributed and Networked Environments, International Conference on Distributed Computing Systems* (ICDCS), *Annual Simulation Symposium, International Workshop on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

1993 Program Committee: *International Conference on Parallel and Distributed Systems* (ICPDS), *IEEE Workshop on Advances in Parallel and Distributed Systems, International Conference on Distributed Computing Systems* (ICDCS), *Annual Simulation Symposium, International Workshop on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

1992 Program Committee: *Annual Simulation Symposium, Second Workshop on the Management of Replicated Data* (WMRD), *International Workshop on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS).

1991 Local Arrangements Chair and Program Committee: *Second Workshop on the Management of Replicated Data* (WMRD).

1990 Publicity Chair: *First Workshop on the Management of Replicated Data* (WMRD).

1989 Program Committee: Usenix Association/ACM/IEEE-CS, *Workshop on Experiences with Building Distributed and Multiprocessor Systems.*

1988 Program Committee: IFIP Working Group 6.5, *International Working Conference on Message Handling Systems and Distributed Applications.*

Membership in Professional Associations

Year	Rank	Professional Society
2019	Member	International Association for Cryptologic Research (IACR)
2012	Member	Armed Forces Communications & Electronics Association
2008	Fellow	American Association for the Advancement of Science (AAAS)
2006	Fellow	Institute of Electrical & Electronics Engineers (IEEE)
2006	Member	American Society for Engineering Education (ASEE)
1991	Member	Usenix Association
1989	Member	Sigma Xi (Scientific Research Society)
1987	Member	IEEE Computer Society
1981	Member	Association for Computing Machinery (ACM)

Consulting

Years	Organization	Role
2015–	Wilson, Sonsini, Goodrich & Rosati	Technical Expert
	Fish & Richardson	Technical Expert
2015	Foley & Lardner	Technical Expert
	DLA Piper	Technical Expert
2014–	Latham & Watkins	Technical Expert
2014	Beck & Hall	Technical Expert
2013–15	Faegre, Baker & Daniels	Technical Expert
	Wilmer Cutler Pickering Hale	Technical Expert
2013–14	County of Tehama	Technical Expert
2012–13	Klarquist Sparkman	Technical Expert
	Wilson, Sonsini, Goodrich & Rosati	Technical Expert
2011–14	Morgan, Lewis & Bockius	Technical Expert
	Fish & Richardson	Technical Expert
2011–13	Connoly Bove	Technical Expert
2011–12	Haynes & Boone	Technical Expert
2011	Fujitsu Semiconductor America	Consultant
2010–12	Quinn Emanuel Urquhart & Sullivan	Technical Expert
	Fish & Richardson	Technical Expert
	Simpson, Thacher & Bartlett	Technical Expert
2009	Preston, Gates & Ellis	Technical Expert
2008–09	Weil, Gotshal & Mange	Technical Expert
2008–10	Hewlett-Packard Laboratories	Consultant
2007–	Center for Communications Research	Adjunct
2006–10	Weil, Gotshal & Manges	Technical Expert
2006–14	Fish & Richardson	Technical Expert
2004–05	Faegre & Benson	Technical Expert
2004	Siemens Technology-to-Business Center	Consultant
2002–	MITRE Corporation	JASON
2002–05	Fish & Richardson	Technical Expert
2001–03	Hecker Law Group	Technical Expert
	Bartlit, Beck, Herman, Palenchar & Scott	Technical Expert
	Jenner & Block	Technical Expert
2000	Sony Music Ventures	Consultant
1997–02	Chief of Naval Research	Consultant

1996	Chatham Group	Technical Expert
1995–11	IBM Almaden Research Center	Visiting Scientist

Editorial Duties

2023 Associate Editor, *Springer Journal of Big Data (JOBD)*

2017–20 Editor-in-Chief, *Letters of the Computer Society*.

2016–19 Associate Editor, *IEEE Transactions on Computers*.

2011 Guest Editor, *Information Systems Databases: Creation, Management and Utilization,* Elsevier, vol. 36, no. 3, May 2011.

2010–16 Editor-in-Chief, *ACM Transactions on Storage*.

2009 Guest Editor, *Web Information Systems Engineering* (WISE 2009), LNCS 5802.

2004–10 Associate Editor, *ACM Transactions on Storage*.

2002–03 Editorial Board, *Mobile Computing and Communications Review*.

1993–97 Editorial Board, *International Journal in Computer Simulation*.

1990–93 Editor, *Bulletin of the IEEE Computer Society Technical Committee on Operating Systems and Applications Environments*.

1990–93 Associate Editor, *International Journal in Computer Simulation*.

Reviewer of Technical Papers and Proposals

2023 ACM Transactions on Computer Systems.

2022 ACM Transactions on Computer Systems; The Journal of Super Computing; Performance Evaluation.

2021 Transactions on Dependable and Secure Computing.

2017 Information Security Journal: A Global Perspective; ACM Transactions on Storage.

2016 ACM Transactions on Modeling and Performance Evaluation of Computing Systems; Israel Science Foundation; Flanders Innovation & Entrepreneurship.

2012 ACM Transactions on Storage; Journal of Computer Science and Technology; IEEE Transactions on Neural Networks and Learning Systems; IEEE Transactions of Reliability.

2009 ACM Transactions on Storage; The Journal of Systems and Software.

2008 ACM Transactions on Storage; IEEE Transactions on Computers; International Conference on Networking, Architecture, and Storage.

2007 ACM Transactions on Storage; IEEE Transactions on Computers; Performance and Dependability Symposium (PDS).

2006 IEEE Transactions on Computers; ACM Transactions on Storage; IEEE Transactions on Magnetics; International Symposium on Stabilization, Safety, and Security of Distributed Systems; International Parallel and Distributed Processing Symposium; University of California, MICRO Program; International Conference on Dependable Systems and Networks.

2005 ACM Transactions on Storage; IEEE/ACM Transactions on Networking.

2004 ACM Transactions on Storage; IEEE Transactions on Computers; IEEE Transactions on Parallel and Distributed Systems; International Journal of Computers and Applications.

2003 Symposium on Operating Systems Principles; IEEE Transactions on Broadcasting; Computer Journal; IEEE Communications Letters.

2002 Transactions on Knowledge and Data Engineering; Transactions on Broadcasting; International Conference on Parallel Processing; IEEE Communications Letters; Symposium on Operating System Design and Implementation; Western Multiconference.

2001 IEEE Personal Communications; Workshop on Hot Topics in Operating Systems (HotOS); ETRI Journal; International Conference on Modeling, Analysis, and Simulation of Computer and Telecommunications Systems; International Conference on Distributed Computing Systems; Symposium on Operating Systems Principles; Western Multiconference.

2000 Transactions on Knowledge and Data Engineering; Symposium on Reliable Distributed Systems; Communications of the ACM; IEEE Personal Communications; Transactions on Computer Systems; Transactions on Modeling and Computer Simulation; Workshop on Wireless Networks and Mobile Computing.

1999 ACM/Baltzer Mobile Networks and Applications; IEEE Software; IEEE Transactions on Software Engineering; International Conference on Modeling, Analysis, and Simulation of Computer and Telecommunications Systems; Usenix Technical Conference; Journal of Parallel and Distributed Computing.

1998 IEEE Software; IEEE Transactions on Parallel and Distributed Systems; ACM Transactions on Computer Systems; Conference on Computing and Telecommunications; International Conference on High Performance Computing; International Conference on Parallel Processing.

1997 National Science Foundation; IEEE Computer; IEEE Transactions on Parallel and Distributed Systems; Symposium on Reliable Distributed Systems; Software – Practice & Experience; IEEE Software; Computer Journal; Transactions on Knowledge and Data Engineering.

1996 National Science Foundation; Computer Journal; University of California, MICRO program; Information Systems Journal; IEEE Transactions on Parallel and Distributed Systems.

1995 University of California, MICRO program; National Science Foundation; Computer Journal; Distributed Systems Engineering Journal; Computing Surveys; Dependable Computing and Critical Applications Conference; IEEE Transactions on Knowledge and Data Engineering.

1994 IEEE Computer; High Performance Distributed Computing; California Space Institute; Operating Systems Design and Implementation; International Journal in Computer Simulation; Information Processing Letters; Journal of Distributed and Parallel Data Bases; IEEE Software. ACM Transactions on Computer Systems.

1993 International Conference on Distributed Computing Systems; Distributed and Parallel Databases; Hawaii International Conference on Systems Sciences; International Workshop on Modeling, Analysis, and Simulation of Computer and Telecommunications Systems; International Symposium on Autonomous Decentralized Systems; IEEE Transactions on Parallel Distributed Systems; IEEE Transactions on Computers; Information Processing Letters; IEEE Computer.

1992 International Symposium on Autonomous Decentralized Systems; IEEE Transactions on Parallel Distributed Systems; IEEE/ACM Transactions on Networking; Information Systems; IFIP Dependable Computing in Critical Applications; IEEE Transactions on Software Engineering; IEEE Transactions on Computers; International Conference on Data Engineering; IEEE Transactions on Knowledge and Data Engineering; University of California, MICRO Program; IEEE Computer; Information Processing Letters.

1991 International Conference on Data Engineering; International Journal on Very Large Databases; ACM Conference on Principles of Data Base Systems; IEEE Transactions on Parallel and Distributed Systems; IEEE Transactions on Knowledge and Data Engineering; Computing Systems; University of California, MICRO Program; IEEE Computer; ACM Transactions on Computer Systems; Information Processing Letters.

1990 IEEE Transactions on Parallel and Distributed Systems; IEEE Transactions on Knowledge and Data Engineering; Computing Systems; Communications of the ACM; 1991 SIGMETRICS Conference on Measurement and Modeling of Computer Systems; University of California, MICRO Program; National Science Foundation; IEEE Computer; ACM Transactions on Computer Systems; Information Processing Letters; IEEE Software.

1989 National Science Foundation; IEEE Computer; ACM Transactions on Computer Systems; Information Processing Letters; IEEE Software; International Conference on Data Engineering; International Conference on Distributed Computing Systems.

1988 International Conference on Distributed Computing Systems.

1987 International Conference on Data Engineering.

Reviewer for Publishers

2011 John Wiley & Sons.

2003 Prentice-Hall.

2002 John Wiley & Sons.

1997 Academic Press; Addison-Wesley; Gordon and Beach.

1995 Addison-Wesley; Benjamin/Cummings; Springer-Verlag.

1994 Benjamin/Cummings; Morgan-Kaufman.

1993 Kluwer Academic Publishers; Norton; Benjamin/Cummings; McGraw-Hill; John Wiley & Sons.

1991–93 Aksen Associates.

1988–91 Addison-Wesley.

Government Service

2020 Intelligence Science and Technology Experts Group (ISTEG) (National Academies of Sciences, Engineering and Medicine committee). National Nuclear Security Administration. Department of Defense.

2019 Intelligence Science and Technology Experts Group (ISTEG) (National Academies of Sciences, Engineering and Medicine committee). National Nuclear Security Administration. Department of Defense. Department of State.

2018 Intelligence Science and Technology Experts Group (ISTEG) (National Academies of Sciences, Engineering and Medicine committee). National Nuclear Security Administration. Department of Defense.

2017 Intelligence Science and Technology Experts Group (ISTEG) (National Academies of Sciences, Engineering and Medicine committee). National Nuclear Security Administration. Department of Defense.

2016 Intelligence Science and Technology Experts Group (ISTEG) (National Academies of Sciences, Engineering and Medicine committee). National Security Directorate Advisory Committee (Pacific Northwest National Laboratory). Computer Information Science External Review Board (Sandia National Laboratory). National Nuclear Security Administration. Department of Energy. Department of Defense.

2015 Intelligence Science and Technology Experts Group (ISTEG) (National Academies of Sciences, Engineering and Medicine committee). National Security Directorate Advisory Committee (Pacific Northwest National Laboratory). Computer Information Science External Review Board (Sandia National Laboratory). National Nuclear Security Administration. Department of Energy. Department of Defense.

2014 National Security Directorate Advisory Committee (Pacific Northwest National Laboratory). Computer Information Science External Review Board (Sandia National Laboratory). National Nuclear Security Administration. Department of Energy. Department of Defense.

2013 National Research Council, Committee on Science and Technology for Defense Warning. National Nuclear Security Administration. Department of Energy. Department of Defense.

2012 National Research Council, Committee for Science and Technology Challenges to U.S. National Security Interests. National Research Council, Committee on Science and Technology for Defense Warning, Standing Committee on Technology Insight-Gauge, Evaluate, and Review (TIGER). National Nuclear Security Administration. Department of Energy. Department of Defense.

2011 National Research Council, Standing Committee on Technology Insight-Gauge, Evaluate, and Review (TIGER). National Research Council, report reviewer. National Nuclear Security Administration. Department of Defense. Department of the Navy.

2010 Department of Energy. National Nuclear Security Administration. Department of Defense. National Research Council, report reviewer.

2009 United States Army Laboratory Assessment Group. Department of Energy. National Nuclear Security Administration. Department of Defense. Department of Energy, Office of Science (Early Career panel).

2008 United States Army Laboratory Assessment Group. National Research Council, Standing Committee on Technology Insight-Gauge, Evaluate, and Review (TIGER). Department of Energy. National Nuclear Security Administration. Department of Defense.

2007 External Review Committee, United States Naval Postgraduate School. United States Army Technology Objectives Review Panel. National Science Foundation (review panels). National Research Council, Standing Committee on Technology Insight-Gauge, Evaluate, and Review (TIGER). National Research Council, Reviewer. Department of Energy. National Nuclear Security Administration. Department of Defense.

2006 National Science Foundation (review panels). National Research Council, Standing Committee on Technology Insight-Gauge, Evaluate, and Review (TIGER). National Research Council, Reviewer. Department of Energy. National Nuclear Security Administration. Department of Defense.

2005 National Research Council, Standing Committee on Technology Insight-Gauge, Evaluate, and Review (TIGER). Department of Energy. National Nuclear Security Administration. Department of Defense.

2004 National Research Council, Defense Intelligence Agency Technology Forecast and Reviews Committee. National Nuclear Security Administration. Department of Defense. Los Alamos National Laboratory, hiring committee for Associate Director for Nuclear Weapons Physics and Principal Associate Director for Nuclear Weapons Programs.

2003 National Science Foundation (two Information Technology Research panels). Department of Energy. National Nuclear Security Administration. Department of Defense.

2002 National Science Foundation (two Information Technology Research panels). Department of Energy. National Nuclear Security Administration.

2001 National Science Foundation. Department of Energy. National Nuclear Security Administration.

2000 National Science Foundation (Information Technology Research panel, National Environmental Observatory Network planning panel, CAREER panel).

1999 National Science Foundation (site review of Data Storage Systems Center, panel on Engineering Research Centers). Department of Defense.

1998 National Science Foundation (site review of Data Storage Systems Center). Department of the Navy.

1997 Department of the Navy.

Service to Professional Societies

2020 IEEE Fellows Evaluation Committee.

2014 IEEE Fellows Evaluation Committee.

2013 IEEE Fellows Evaluation Committee.

2011–12 Member and Chair Emeritus, IEEE Reynold B. Johnson Information Storage Systems Award Committee.

2011 IEEE Fellows Evaluation Committee, IEEE Fellow Society/Technical Council Evaluator.

2010 IEEE Fellows Evaluation Committee.

2008–11 Chair, IEEE Reynold B. Johnson Information Storage Systems Award Committee, IEEE Technical Field Awards Council.

2007 IEEE Fellows Evaluation Committee.

2006–08 IEEE Reynold B. Johnson Information Storage Systems Award Committee.

2000–02 Chair, Usenix Association Scholarship and Research Committee.

1998–02 Usenix Association Scholarship and Research Committee.

1997– University Liaison for the Usenix Association.

1997 Committee on the Future of the Usenix Association.

1996– Executive Committee, *IEEE Technical Committee on Operating Systems*.

1995 IEEE/ACM focus group on Software Engineering Body of Knowledge and Recommended Practices.

1993–96 Chair, *IEEE Technical Committee on Operating Systems and Applications Environments*.

University Service

Senate Service

2018–19 Committee on Research.

2016–17 Committee on Academic Freedom.

2008–09 Committee on Academic Personnel *ad hoc* subcommittee.

2007–08 Committee on Academic Personnel *ad hoc* subcommittee.

2006–07 Committee on Research.

2005–06 Committee on Research; Committee on Academic Personnel *ad hoc* subcommittee.

2003–04 Committee on Committees; Committee on Academic Personnel *ad hoc* subcommittee.

2001–02 Committee on Academic Personnel *ad hoc* subcommittee; Committee on Research.

2000–01 Committee on Research; Chair, Committee on Academic Personnel *ad hoc* subcommittee;

2000–01 Silicon Valley Regional Center Task Force; California Institutes for Science and Innovation proposal (with P. Mantey & Berkeley colleagues).

1999–00 Committee on Academic Personnel *ad hoc* subcommittee; Computing and Telecommunications Committee.

1998–99 Computing and Telecommunications Committee.

1995–97 Senate Rules Committee, Information Technology Disaster Preparedness Task Force.

Campus Service

2015– Genomics Institute Steering Committee.

2004–05 Confidential personnel review for senior administrator.

2000–04 Chair, Engineering II Building Committee.

1998–99 Confidential personnel review for senior administrator.

1998 Faculty mentor, California Alliance for Minority Participation (CAMP).

1997 Faculty mentor, California Alliance for Minority Participation (CAMP).

1996–97 Information Technology Disaster Preparedness Task Force.

1994–95 Task Force on Computer and Network Security, Summer Science Honors Institute.

1990–91 Technical Consultant to Computing and Telecommunication Services (CATS) for University computing facilities.

1988–89 Applied Sciences Building Remodeling Committee. Open Access Computing Committee.

School of Engineering Service

2017– Strategic Faculty Advisor to the School of Engineering.

2004–10 Associate Dean for Research and Graduate Studies.

1998–01 Associate Dean for Research.

1995–96 Electrical Engineering/Applied and Engineering Mathematics Committee.

1988–90 Natural Sciences Division Space Committee.

Departmental Service

2015–16 Personnel Review Committee; Chair, *ad hoc* Personnel Committee; Security & Privacy faculty hiring committee.

2014–15 Personnel Review Committee; Chair, *ad hoc* Personnel Committee; Experimental Computer Science faculty hiring committee.

2013–14 Department Chair Selection Committee; Personnel Review Committee; Data Sciences faculty hiring committee.

2011–12 Personnel Best Practices Committee; Personnel Review Committee; Chair, *ad hoc* Personnel Committee.

2010–11 Department Awards Coordinator; Chair, *ad hoc* Personnel Committee; Chair, Adjunct Committee.

2009–10 Director for Research, Computer Science Department; Chair, Adjunct Committee.

2008–09 Director for Research, Computer Science Department; Chair, Adjunct Committee.

2007–08 Director for Research, Computer Science Department; Chair, Adjunct Committee; Seminar Coordinator, Computer Science Department.

2006–07 Personnel Review Committee; Director for Research, Computer Science Department.

2005–06 Personnel Review Committee; Director for Research, Computer Science Department; Department of Information Systems and Technology Management.

2004–05 Director for Research, Computer Science Department; Master of Ceremonies, Engineering 2 dedication; Information Technologies Institute (ITI) Executive Committee.

2003–04 Director for Research, Computer Science Department; Information Technologies Institute (ITI) Executive Committee; School of Engineering Technical Services Committee.

2002–03 Chair, Promotion Review Subcommittee; Computer Science Faculty Recruitment Committee; ISTM Chair Recruitment; Faculty Recruitment Committee.

2001–02 Chair, Promotion Review Subcommittee; Computer Science Faculty Recruitment Committee; Computer Science Department Facilities Director; Computing Infrastructure Committee; Faculty Recruitment Committee.

2000–01 Computer Science Faculty Recruitment Committee; Computer Science Department Facilities Director; Computing Infrastructure Committee; Faculty Recruitment Committee.

1999–00 Computer Science Faculty Recruitment Committee; Computer Science Department Facilities Director; Computing Infrastructure Committee; Faculty Recruitment Committee.

1998–99 Computer Science Faculty Recruitment Committee; Computer Science Department Facilities Director; Computing Infrastructure Committee; Faculty Recruitment (Software Engineering); Information Systems Management Major.

1997–98 Computer Science Faculty Recruitment Committee; Computer Science Department Facilities Director; Information Systems Management Major.

1991–96 Computer Science Facilities Director.

1990–91 Computer & Information Sciences Assistant Facilities Director.

1989–90 Computer & Information Sciences Department Faculty Recruitment Committee, Co-Chair for the Operating Systems position.

1989 Computer & Information Sciences Department Representative to Electronics Engineering Program Development Committee.

1988–89 Research Funding Director, Computer & Information Sciences Department (responsible for the CIS/CE 1989 grant proposal to the National Science Foundation Institutional Infrastructure Program).

1988–89 Computer & Information Sciences Department Representative on Computer Engineering Department Recruitment Committee.

System-wide Service

2020–23 Academic Council's Special Committee on Laboratory Issues (ACSCOLI).

2011–16 Academic Council's Special Committee on Laboratory Issues (ACSCOLI).

2007–13 Science & Technology Committee for both Lawrence Livermore and Los Alamos National Laboratories (University of California, Office of the President).

2007–14 Multiple Directorate and Capability review committees for Lawrence Livermore and Los Alamos National Laboratories (University of California, Office of the President).

2007–08 Advisory Board, Department of Computer Engineering, Santa Clara University; Predictive Knowledge Systems Advisory Committee, Lawrence Livermore National Laboratory (University of California, Office of the President).

2007 Nonproliferation, Homeland and International Security, Directorate Review Committee, Lawrence Livermore National Laboratory; Petascale Computing Management Review Committee, Los Alamos National Laboratory (University of California, Office of the President).

2005–20 Faculty Advisory Group for the South Asia Initiative.

2005– Executive Committee, Center for Information technology Research in the Interest of Society (CITRIS).

2003–07 National Security Panel and Intelligence Panel for the National Laboratories (University of California, Office of the President).

2002–03 Chair, University-wide Committee on Research Policy; National Security Panel, Science & Technology Panel, and President's Council (University-wide Senate Representative).

2001–02 Vice Chair, University-wide Committee on Research Policy; Screening Committee for the Director of Lawrence Livermore National Laboratory; National Security Panel, Science & Technology Panel, President's Council (University-wide Senate Representative).

2000–03 University-wide Committee on Research Policy.

TEACHING 1988–89

				Enrolled	%Eval Retd	Shared?
Fall	CIS	104	Introduction to Compiler Design	43	74	no
	CIS	301	Supervised Teaching Experience	1	n/a	no
Winter	CIS	221	Advanced Operating Systems	5	100	no
Spring	CIS	104	Introduction to Compiler Design	31	74	no
	CIS	301	Supervised Teaching Experience	1	100	no

TEACHING 1989–90

				Enrolled	%Eval Retd	Shared?
Fall	CIS	204	Compiler Design	18	94	no
	CIS	297	Independent Study/Research	1	n/a	no
	CIS	299	Thesis Research	1	n/a	no
Winter	CIS	104	Introduction to Compiler Design	17	88	no
	CIS	195	Independent Study/Research	1	n/a	no
	CIS	221	Advanced Operating Systems	8	88	no
	CIS	299	Thesis Research	3	n/a	no
	CIS	301	Supervised Teaching Experience	1	100	no
Spring	CIS	104	Introduction to Compiler Design	22	86	no
	CIS	297	Independent Study/Research	2	n/a	no
	CIS	299	Thesis Research	3	n/a	no
	CIS	301	Supervised Teaching Experience	1	100	no

TEACHING 1990–91

				Enrolled	%Eval Retd	Shared?
Fall	CIS	204	Compiler Design	10	100	no
	CIS	221	Advanced Operating Systems	12	75	no
	CIS	299	Thesis Research	3	n/a	no
Winter	CIS	104A	Fundamentals of Compiler Design I	18	67	no
	CIS	198	Independent Study/Research	2	n/a	no
	CIS	297	Independent Study/Research	1	n/a	no
	CIS	299	Thesis Research	3	n/a	no
	CIS	301	Supervised Teaching Experience	1	n/a	no
Spring	CIS	104B	Fundamentals of Compiler Design II	17	76	no
	CIS	195	Independent Study/Research	2	n/a	no
	CIS	297	Independent Study/Research	2	n/a	no

TEACHING 1991–92

				Enrolled	%Eval Retd	Shared?
Fall	CIS	221	Advanced Operating Systems	9	100	no
	CIS	198	Independent Study/Research	1	n/a	no
	CIS	297	Independent Study/Research	2	n/a	no
	CIS	299	Thesis Research	1	n/a	no
Winter	CIS	198	Independent Study/Research	2	n/a	no
	CIS	297	Independent Study/Research	3	n/a	no

	CIS	299	Thesis Research	3	n/a	no
Spring	CIS	104B	Fundamentals of Compiler Design II	14	79	no
	CIS	195	Independent Study/Research	2	n/a	no
	CIS	198	Independent Study/Research	1	n/a	no
	CIS	203	Programming Languages & Environments	8	88	no
	CIS	297	Independent Study/Research	3	n/a	no
	CIS	299	Thesis Research	5	n/a	no
	CIS	301	Supervised Teaching Experience	1	100	no

TEACHING 1992–93

				Enrolled	%Eval Retd	Shared?
Fall	CIS	111	Introduction to Operating Systems	43	80	no
	CIS	299	Thesis Research	6	n/a	no
	CIS	301	Supervised Teaching Experience	1	100	no
Winter	CIS	198	Independent Study/Research	1	n/a	no
	CIS	204	Compiler Design	5	100	no
	CIS	297	Independent Study/Research	4	n/a	no
	CIS	299	Thesis Research	3	n/a	no
Spring	CIS	195	Senior Thesis Research	1	n/a	no
	CIS	221	Advanced Operating Systems	8	100	no
	CIS	297	Independent Study/Research	4	n/a	no
	CIS	299	Thesis Research	3	n/a	no
	Stev	003	Privacy & Computer Security	11	73	no

TEACHING 1993–94

				Enrolled	%Eval Retd	Shared?
Fall	CIS	111	Introduction to Operating Systems	36	78	no
	CIS	297	Independent Study/Research	4	n/a	no
	CIS	299	Thesis Research	3	n/a	no
	CIS	301	Supervised Teaching Experience	1	100	no
Winter	CIS	204	Compiler Design	5+1	100	no
	CIS	297	Independent Study/Research	10	n/a	no
	CIS	299	Thesis Research	1	n/a	no
Spring	CIS	203	Programming Languages & Environments	21	85	no
	CIS	297	Independent Study/Research	8	n/a	no
	CIS	299	Thesis Research	5	n/a	no

TEACHING 1994–95

				Enrolled	%Eval Retd	Shared?
Fall	CIS	111	Introduction to Operating Systems	56	68	no
	CIS	195	Senior Thesis Research	1	n/a	no
	CIS	221	Advanced Operating Systems	15	60	no
	CIS	297	Independent Study/Research	3	n/a	no
	CIS	299	Thesis Research	9	n/a	no
	CIS	301	Supervised Teaching Experience	1	100	no
Winter	CIS	198	Independent Study/Research	3	n/a	no

	CIS	297	Independent Study/Research	5	n/a	no
	CIS	299	Thesis Research	10	n/a	no
Spring	CIS	195	Senior Thesis Research	1	n/a	no
	CIS	203	Programming Languages & Environments	16+3	95	no
	CIS	297	Independent Study/Research	2	n/a	no
	CIS	299	Thesis Research	10	n/a	no
	CIS	301	Supervised Teaching Experience	1	100	no

TEACHING 1995–96

				Enrolled	%Eval Retd	Shared?
Fall	CIS	111	Introduction to Operating Systems	18	78	no
	CIS	204	Compiler Design	6	83	no
	CIS	297	Independent Study/Research	3	n/a	no
	CMPE	297	Independent Study/Research	1	n/a	no
	CIS	299	Thesis Research	3	n/a	no
Winter	CIS	198	Independent Study/Research	2	n/a	no
	CIS	297	Independent Study/Research	4	n/a	no
	CIS	299	Thesis Research	3	n/a	no
Spring	CIS	195	Senior Thesis Research	1	n/a	no
	CIS	221	Advanced Operating Systems	13	77	no
	CIS	297	Independent Study/Research	3	n/a	no
	CMPE	297	Independent Study/Research	1	n/a	no
	CIS	299	Thesis Research	6	n/a	no
	CMPE	299	Thesis Research	1	n/a	no

TEACHING 1996–97

				Enrolled	%Eval Retd	Shared?
Fall	CMPS	111	Introduction to Operating Systems	20	70	no
	CMPS	195	Thesis Research	1	n/a	no
	CMPS	297	Independent Study/Research	8	n/a	no
	CMPE	297	Independent Study/Research	4	n/a	no
	CMPS	299	Thesis Research	5	n/a	no
	CMPE	299	Thesis Research	3	n/a	no
	CMPS	301	Supervised Teaching Experience	1	100	no
Winter	CMPS	290X	Cryptography	6	67	no
	CMPS	297	Independent Study/Research	5	n/a	no
	CMPS	299	Thesis Research	6	n/a	no
	CMPE	299	Thesis Research	2	n/a	no
Spring	CMPS	090X	Internet Security & Privacy	19	58	no
	CMPS	221	Advanced Operating Systems	8	88	no
	CMPS	297	Independent Study/Research	6	n/a	no
	CMPS	299	Thesis Research	6	n/a	no
	CMPE	299	Thesis Research	3	n/a	no

TEACHING 1997–98

				Enrolled	%Eval Retd	Shared?

Fall	CMPS		Sabbatical Leave			
	CMPS	297	Independent Study/Research	1	n/a	no
	CMPS	299	Thesis Research	9	n/a	no
	CMPE	299	Thesis Research	3	n/a	no
Winter	CMPS	112	Comparative Programming Languages	58	60	no
	CMPS	297	Independent Study/Research	3	n/a	no
	CMPS	299	Thesis Research	10	n/a	no
	CMPE	299	Thesis Research	2	n/a	no
	CMPS	301	Supervised Teaching Experience	1	n/a	no
Spring	CMPS	221	Advanced Operating Systems	9	100	no
	CMPS	297	Independent Study/Research	2	n/a	no
	CMPS	299	Thesis Research	8	n/a	no
	CMPE	299	Thesis Research	1	n/a	no

TEACHING 1998–99

				Enrolled	%Eval Retd	Shared?
Fall	CMPE	299	Thesis Research	1	n/a	no
	CMPS	297	Independent Study/Research	3	n/a	no
	CMPS	299	Thesis Research	6	n/a	no
Winter	CMPE	299	Thesis Research	1	n/a	no
	CMPS	297	Independent Study/Research	4	n/a	no
	CMPS	299A	Thesis Research	6	n/a	no
Spring	CMPE	299	Thesis Research	1	n/a	no
	CMPS	111	Introduction to Operating Systems	62	76	no
	CMPS	221	Advanced Operating Systems	6	100	no
	CMPS	297	Independent Study/Research	2	n/a	no
	CMPS	299	Thesis Research	5	n/a	no
	CMPS	301	Supervised Teaching Experience	1	100	no
Summer	CMPS	198	Independent Study/Research	1	n/a	no

TEACHING 1999–00

				Enrolled	%Eval Retd	Shared?
Fall	CMPE	299	Thesis Research	1	n/a	no
	CMPS	111	Introduction to Operating Systems	45	63	no
	CMPS	297	Independent Study/Research	2	n/a	no
	CMPS	299	Thesis Research	6	n/a	no
	CMPS	301	Supervised Teaching Experience	1	100	no
Winter	CMPS	112	Comparative Programming Languages	47	73	no
	CMPS	290X	Cryptography	3	0	no
	CMPS	297	Independent Study/Research	3	n/a	no
	CMPS	299	Thesis Research	2	n/a	no
Spring	CMPS	198	Independent Study/Research	1	n/a	no
	CMPS	297	Independent Study/Research	2	n/a	no
	CMPS	299	Thesis Research	3	n/a	no

TEACHING 2000–01

				Enrolled	%Eval Retd	Shared?

Fall	CMPS	299C	Thesis Research	2	n/a	no
	CMPS	301	Supervised Teaching Experience	1	n/a	no
	ISM	150	Introduction To Information Networks	36	0	no
Winter	CMPS	112	Comparative Programming Languages	75	77	no
	CMPS	297A	Individual Study/ Research	1	n/a	no
	CMPS	299C	Thesis Research	2	n/a	no
	CMPS	301	Supervised Teaching Experience	1	n/a	no
Spring	CMPS	297A	Individual Study/ Research	3	n/a	no
	CMPS	299C	Thesis Research	2	n/a	no
Summer	CMPS	297A	Individual Study/ Research	1	n/a	no
	CMPS	299A	Thesis Research	1	n/a	no

TEACHING 2001–02

				Enrolled	%Eval Retd	Shared?
Fall	CMPS	198	Individual Study/Research	2	n/a	no
	CMPS	297A	Individual Study/Research	1	n/a	no
	CMPS	299C	Thesis Research	2	n/a	no
	ISM	150	Introduction To Information Networks	54	69	no
Winter	CMPS	195	Senior Thesis Research	1	n/a	no
	CMPS	198	Individual Study/Research	1	n/a	no
	CMPS	221	Advanced Operating Systems	17	82	no
	CMPS	221-50	Advanced Operating Systems	9	89	no
	CMPS	297A	Individual Study/Research	2	n/a	no
	CMPS	299C	Thesis Research	2	n/a	no
Spring	CMPS	112	Comparative Programming Languages	62	61	no
	CMPS	198	Individual Study/Research	1	n/a	no
	CMPS	296	Masters Project	1	n/a	no
	CMPS	297A	Individual Study/Research	1	n/a	no
	CMPS	297B	Individual Study/Research	1	n/a	no
	CMPS	299A	Thesis Research	1	n/a	no
	CMPS	299C	Thesis Research	2	n/a	no
Summer	CMPS	297A	Individual Study/Research	1	n/a	no

TEACHING 2002–03

				Enrolled	%Eval Retd	Shared?
Fall	CMPS	111	Introduction To Operating Systems	53	92	no
	CMPS	280S	Seminar On Computer Systems	10	n/a	no
	CMPS	297A	Individual Study/Research	2	n/a	no
	CMPS	297B	Individual Study/Research	1	n/a	no
Winter	CMPS	296	Masters Project	1	n/a	no
	CMPS	297A	Individual Study/Research	3	n/a	no
	CMPS	297B	Individual Study/Research	1	n/a	no
Spring	CMPE	299B	Thesis Research	1	n/a	no
	CMPS	229	Storage Systems	8	100	no
	CMPS	299B	Thesis Research	1	n/a	no

TEACHING 2003–04

				Enrolled	%Eval Retd	Shared?
Fall	CMPS	13H	Introduction Programming/Data Structures	9	77	no
	CMPS	280S	Seminar Computer Systems	14	0	no
	CMPS	297A	Individual Study	1	n/a	no
	CMPS	299A	Thesis Research	1	n/a	no
	CMPS	299B	Thesis Research	1	n/a	no
Winter	CMPS	111	Introduction Operating Systems	47	70	no
	CMPS	297A	Individual Study	3	n/a	no
	CMPS	299B	Thesis Research	2	n/a	no
Spring	CMPE	297B	Individual Study	1	n/a	no
	CMPS	290S	Adv Topics: Computer Systems	7	100	no
	CMPS	297A	Individual Study	2	n/a	no
	CMPS	299A	Thesis Research	2	n/a	no
	CMPS	299B	Thesis Research	1	n/a	no

TEACHING 2004–05

				Enrolled	%Eval Retd	Shared?
Fall	CMPS	296	Masters Project	1	n/a	no
	CMPS	297A	Individual Study	1	n/a	no
	CMPS	299A	Thesis Research	1	n/a	no
	CMPS	299B	Thesis Research	1	n/a	no
Winter	CMPE	299A	Thesis Research	1	n/a	no
	CMPE	299B	Thesis Research	1	n/a	no
	CMPS	296	Masters Project	1	n/a	no
	CMPS	297A	Individual Study	1	n/a	no
	CMPS	299A	Thesis Research	2	n/a	no
	CMPS	280S	Seminar Computer Systems	18	50	no
Spring	CMPS	111	Introduction to Operating Systems	58	76	no
	CMPS	297A	Individual Study	2	n/a	no
	CMPS	297B	Individual Study	1	n/a	no
	CMPS	299A	Thesis Research	1	n/a	no
	CMPS	299B	Thesis Research	1	n/a	no
Summer	CMPS	297A	Individual Study	1	n/a	no

TEACHING 2005–06

				Enrolled	%Eval Retd	Shared?
Fall	CMPS	296	Masters Project	1	n/a	no
	CMPS	297A	Individual Study	2	n/a	no
	CMPS	299A	Thesis Research	1	n/a	no
	CMPS	299B	Thesis Research	2	n/a	no
	CMPS	299C	Thesis Research	1	n/a	no
Winter	CMPS	60N	Beginning Programming	3	133	no
	CMPS	299A	Thesis Research	2	n/a	no
	CMPS	299B	Thesis Research	3	n/a	no
	CMPS	299C	Thesis Research	1	n/a	no
Spring	CMPS	111	Introduction to Operating Systems	24	108	yes

CMPS	280	Seminar on Computer Systems	13	8	no
CMPS	299A	Thesis Research	3	n/a	no
CMPS	299B	Thesis Research	2	n/a	no
CMPS	299C	Thesis Research	1	n/a	no

TEACHING 2006–07

				Enrolled	%Eval Retd	Shared?
Fall	CMPS	299B	Thesis Research	2	n/a	no
	CMPS	299B	Thesis Research	2	n/a	no
Winter	CMPS	299A	Thesis Research	2	n/a	no
	CMPS	299B	Thesis Research	2	n/a	no
Spring	CMPS	111	Introduction to Operating Systems	14	86	no
	CMPS	198	Individual Study or Research	1	n/a	no
	CMPS	280S	Seminar on Computer Systems	16	13	no
	CMPS	299B	Thesis Research	2	n/a	no

TEACHING 2007–08

				Enrolled	%Eval Retd	Shared?
Fall	CMPS	221	Advanced Operating Systems	10	90	no
	CMPS	280S	Seminar on Computer Systems	10	50	no
	CMPS	299B	Thesis Research	2	n/a	no
Winter	CMPS	297A	Individual Study	1	n/a	no
	CMPS	299B	Thesis Research	1	n/a	no
	CMPS	299C	Thesis Research	1	n/a	no
Spring	CMPS	111	Introduction to Operating Systems	38	71	no
	CMPS	198	Individual Study or Research	1	n/a	no
	CMPS	280S	Seminar on Computer Systems	13	62	no
	CMPS	297A	Individual Study	1	n/a	no
	CMPS	297B	Individual Study	1	n/a	no
	CMPS	299B	Thesis Research	1	n/a	no
	CMPS	299C	Thesis Research	1	n/a	no

TEACHING 2008–09

				Enrolled	%Eval Retd	Shared?
Fall	CMPE	297B	Individual Study	1	n/a	no
	CMPS	111	Introduction to Operating Systems	21	43	no
	CMPS	296	Masters Project	1	n/a	no
	CMPS	297B	Individual Study	1	n/a	no
	CMPS	299A	Thesis Research	1	n/a	no
	CMPS	299C	Thesis Research	2	n/a	no
Winter	CMPS	297A	Individual Study	1	n/a	no
	CMPS	297B	Individual Study	1	n/a	no
	CMPS	299C	Thesis Research	2	n/a	no
Spring	CMPS	223	Advanced Computer Security	12	83	no
	CMPS	223	Advanced Computer Security (LANL)	2	100	no
	CMPS	297A	Individual Study	2	n/a	no

	CMPS	297B	Individual Study	1	n/a	no
	CMPS	299C	Thesis Research	1	n/a	no

TEACHING 2009–10

				Enrolled	%Eval Retd	Shared?
Fall	CMPS	5P	Introduction to Programming in Python	92	48	no
	CMPS	280S	Seminar on Computer Systems	16	75	no
	CMPS	297B	Individual Study	1	n/a	no
	CMPS	297C	Individual Study	2	n/a	no
	CMPS	299C	Thesis Research	2	n/a	no
Winter	CMPS	297A	Individual Study	2	n/a	no
	CMPS	299C	Thesis Research	2	n/a	no
Spring	CMPS	198F	Independent Study or Research	1	n/a	no
	CMPS	229	Storage Systems	11	82	no
	CMPS	280S	Seminar on Computer Systems	14	36	no
	CMPS	297B	Individual Study	1	n/a	no
	CMPS	299A	Thesis Research	1	n/a	no
	CMPS	299C	Thesis Research	3	n/a	no

TEACHING 2010–11

				Enrolled	%Eval Retd	Shared?
Fall	CMPS	5C	Introduction to Programming in C/C++	119	45	no
	CMPS	280S	Seminar on Computer Systems	12	33	yes
	CMPS	297B	Individual Study	1	n/a	no
	CMPS	297C	Individual Study	1	n/a	no
	CMPS	299C	Thesis Research	3	n/a	no
Winter	CMPS	297A	Individual Study	1	n/a	no
	CMPS	297B	Individual Study	1	n/a	no
	CMPS	299C	Thesis Research	5	n/a	no
Spring	CMPS	111	Introduction to Operating Systems	28	64	no
	CMPS	280S	Seminar on Computer Systems	13	69	no
	CMPS	296	Masters Project	1	n/a	no
	CMPS	297A	Individual Study	1	n/a	no
	CMPS	297C	Individual Study	1	n/a	no
	CMPS	299B	Thesis Research	1	n/a	no
	CMPS	299C	Thesis Research	3	n/a	no

TEACHING 2011–12

				Enrolled	%Eval Retd	Shared?
Fall	CMPS	198	Independent Study or Research	1	n/a	no
	CMPS	280S	Seminar on Computer Systems	20	40	yes
	CMPS	296	Masters Project	1	n/a	no
	CMPS	297A	Individual Study	1	n/a	no
	CMPS	297B	Individual Study	1	n/a	no
	CMPS	299C	Thesis Research	5	n/a	no
Winter	CMPS	229	Storage Systems	13	38	no

	CMPS	297A	Individual Study	2	n/a	no
	CMPS	299B	Thesis Research	1	n/a	no
	CMPS	299C	Thesis Research	5	n/a	no
Spring	CMPS	299C	Thesis Research	1	n/a	no
	CMPS	5P	Introduction to Programming in Python	136	66	no
	CMPS	280S	Seminar on Computer Systems	19	47	no
	CMPS	296	Masters Project	1	n/a	no
	CMPS	297A	Individual Study	2	n/a	no
	CMPS	297B	Individual Study	2	n/a	no
	CMPS	297C	Individual Study	1	n/a	no
	CMPS	299C	Thesis Research	5	n/a	no
Summer	CMPS	297A	Individual Study	3	n/a	no
	CMPS	299	Thesis Research	1	n/a	no

TEACHING 2012–13

				Enrolled	%Eval Retd	Shared?
Fall	CMPS	280S	Seminar on Computer Systems	17	76	no
	CMPS	297A	Individual Study	1	n/a	no
	CMPS	297B	Individual Study	2	n/a	no
	CMPS	299C	Thesis Research	6	n/a	no
Winter	CMPS	297A	Individual Study	2	n/a	no
	CMPS	297B	Individual Study	3	n/a	no
	CMPS	297C	Individual Study	2	n/a	no
	CMPS	299A	Thesis Research	1	n/a	no
	CMPS	299C	Thesis Research	5	n/a	no
Spring	CMPS	280S	Seminar on Computer Systems	14	71	no
	CMPS	290X	Cryptgraph/Security	7	43	no
	CMPS	296	Masters Project	1	n/a	no
	CMPS	297A	Individual Study	1	n/a	no
	CMPS	297B	Individual Study	3	n/a	no
	CMPS	299B	Thesis Research	1	n/a	no
	CMPS	299C	Thesis Research	6	n/a	no

TEACHING 2013–14

				Enrolled	%Eval Retd	Shared?
Fall	CMPS	105	Systems Programming	18	22	no
	CMPS	280S	Seminar on Computer Systems	13	23	yes
	CMPS	297C	Individual Study	1	n/a	no
	CMPS	299B	Thesis Research	1	n/a	no
	CMPS	299C	Thesis Research	5	n/a	no
Summer	CMPS	297	Independent Study or Research	1	n/a	no
	CMPS	297A	Individual Study	1	n/a	no
Winter	CMPS	111	Introduction to Operating Systems	32	59	no
	CMPS	297B	Individual Study	1	n/a	no
	CMPS	297C	Individual Study	1	n/a	no
	CMPS	299A	Thesis Research	2	n/a	no
	CMPS	299B	Thesis Research	1	n/a	no
	CMPS	299C	Thesis Research	4	n/a	no

	EE	195	Senior Thesis Research	1	n/a	no
Spring	CMPS	280S	Seminar Computer Systems	14	50	no
	CMPS	297C	Individual Study	1	n/a	no
	CMPS	299A	Thesis Research	2	n/a	no
	CMPS	299C	Thesis Research	5	n/a	no

TEACHING 2014–15

				Enrolled	%Eval Retd	Shared?
Fall	CMPS	297C	Individual Study	1	n/a	no
	CMPS	299B	Thesis Research	1	n/a	no
	CMPS	299C	Thesis Research	5	n/a	no
Winter	CMPS	111	Introduction to Operating Systems	42	69	no
	CMPS	280S	Seminar Computer Systems	11	45	yes
	CMPS	297C	Individual Study	1	n/a	no
	CMPS	299B	Thesis Research	1	n/a	no
	CMPS	299C	Thesis Research	5	n/a	no
Spring	CMPS	223	Advanced Computer Security	7	86	no
	CMPS	195	Senior Thesis Research	1	n/a	no
	CMPS	280S	Seminar Computer Systems	11	45	yes
	CMPS	297B	Individual Study	1	n/a	no
	CMPS	299B	Thesis Research	1	n/a	no
	CMPS	299C	Thesis Research	6	n/a	no

TEACHING 2015–16

				Enrolled	%Eval Retd	Shared?
Summer	CMPS	299A	Thesis Research	1	n/a	no
Fall	CMPS	13H	Honors Introduction to Programming	40	68	no
	CMPS	13L	Honors Introduction to Programming Laboratory	17	n/a	no
	CMPS	13L	Honors Introduction to Programming Laboratory	19	n/a	no
	CMPS	280S	Seminar Computer Systems	9	44	yes
	CMPS	299C	Thesis Research	4	n/a	no
	DANM	297	Independent Study	1	n/a	no
Winter	CMPS	111	Introduction to Operating Systems	77	34	no
	CMPS	280S	Seminar Computer Systems	7	29	yes
	CMPS	299C	Thesis Research	3	n/a	no
Spring	CMPS	198F	Independent Study or Research	1	n/a	no
	CMPS	229	Storage Systems	9	89	no
	CMPS	280S	Seminar Computer Systems	14	64	yes
	CMPS	299C	Thesis Research	4	n/a	no

TEACHING 2016–17

				Enrolled	%Eval Retd	Shared?
Summer	CMPE	198	Independent Study or Research	1	n/a	no
	CMPS	193	Field Study	1	n/a	no
Fall	CMPS	296	Masters Project	1	n/a	no
	CMPS	299C	Thesis Research	2	n/a	no

Winter	CMPS	111	Introduction to Operating Systems	115	37	no
	CMPS	280S	Seminar Computer Systems	10	60	no
	CMPS	299C	Thesis Research	2	n/a	no
Spring	CMPE	297A	Individual Study	1	n/a	no
	CMPS	12B	Introduction to Data Structures	339	27	no
	CMPS	12M	Data Structures Laboratory	317	28	no
	CMPS	280S	Seminar Computer Systems	11	36	no

TEACHING 2017–18

				Enrolled	%Eval Retd	Shared?
Summer	CMPE	198	Individual Study or Research	1	n/a	no
Fall			Medical Leave			
Winter	CMPE	194F	Dangerous World	14	n/a	no
	CMPE	198F	Individual Study or Research	3	n/a	no
	CMPS	280S	Seminar Computer Systems	7	43	no
	CMPS	111	Introduction to Operating Systems	34	26	no
	CMPS	296	Masters Project	1	n/a	no
	CMPS	297A	Individual Study	3	n/a	no
	CMPS	297B	Individual Study	1	n/a	no
Spring	CMPE	236	Understanding Cryptography	10	100	no
	CMPE	296	Masters Project	2	n/a	no
	CMPE	297A	Individual Study	4	n/a	no
	CMPE	297B	Individual Study	2	n/a	no

TEACHING 2018–19

				Enrolled	%Eval Retd	Shared?
Summer	CMPE	198	Individual Study or Research	1	n/a	no
	CMPS	299	Thesis Research	1	n/a	no
Fall	CMPE	280S	Seminar Computer Systems	8	50	no
	CMPE	297A	Individual Study	2	n/a	no
	CMPE	297B	Individual Study	2	n/a	no
	CMPE	299A	Thesis Research	1	n/a	no
	CMPS	111	Introduction to Operating Systems	44	23	no
Winter	CMPE	195	Senior Thesis	4	n/a	no
	CMPS	198	Individual Study or Research	1	n/a	no
	CMPS	297A	Individual Study	2	n/a	no
	CMPS	297C	Individual Study	1	n/a	no
	CMPS	299A	Thesis Research	1	n/a	no
Spring	CMPS	280S	Seminar Computer Systems	11	36	no
	CMPE	296	Masters Project	1	n/a	no
	CMPE	297A	Individual Study	1	n/a	no
	CMPE	297B	Individual Study	1	n/a	no
	CMPE	299B	Thesis Research	1	n/a	no
	CMPE	299C	Thesis Research	1	n/a	no
	CMPS	111	Introduction to Operating Systems	154	23	no

TEACHING 2019–2020

				Enrolled	%Eval Retd	Shared?
Fall	CSE	13S	Computer Systems and C Programming	49	18	no
	CSE	280S	Seminar Computer Systems	11	27	no
Winter	CSE	13S	Computer Systems and C Programming	90	11	no
	CSE	280S	Seminar Computer Systems	11	27	no
Spring	CSE	234	Understanding Cryptography	23	52	no
	CSE	280S	Seminar Computer Systems	6	17	no

Mentoring and Advising

Advisor to Continuing Students

Degree Goal	Year Entered	Name
M.S.	2022	Eugene Chou
M.S.	2020	Sabrina Au
Ph.D.	2020	Kyle Fredrickson
Ph.D.	2018	Austen Barker
Ph.D.	2016	Oceane Bel
Ph.D.	2015	James Hughes
Ph.D.	2010	Michael McThrow

Postdoctoral Scholars

Name	Dates	Relationship	Degree Year	Institution
Yasu Ohara	2011 Fall–2013 Fall	Primary	2008	Keio University
Se Jin Kwon	2016 Spring–2017 Winter	Primary	2012	Ajou University

Doctor of Philosophy

Degree Year	Name	Relationship	Dissertation
2017	Joel Frank	Primary	Percival: A Reliable, Long-term, Distributed Storage System Free of Fixed-key Encryption
2017	Yan Li	Primary	ASCAR: Fully Autonomous Storage Contention Management System
2016	Stephanie Jones	Primary	Techniques for Reducing Long-term Data Movement on Shingled Magnetic Recording Drives
2016	Alexander Nelson	Primary	Software Signature Derivation From Sequential Digital Forensic Analysis
2016	Christina Strong	Primary	Data Allocation Approaches for Optimizing Storage Systems
2015	Alexandra Holloway	Primary	Design of a Data-Driven Micro-Display for Situation Awareness in Bursty Environments
2015	D. J. Capelis	Primary	Integrating Security into Lower Layers after Their Design
2013	Aleatha Parker-Wood	Primary	Improving File Management through Provenance and Rich Metadata
2010	Deepavali Bhagwat	Primary	Deduplication for Large Scale Backup and Archival Storage
2008	David Pease	Primary	Storage Tank: A Storage Area Network File System
2006	Lawrence You	Primary	Efficient Archival Data Storage
2005	Bo Hong	Co-Advisor	File and Storage Systems for MEMS-Based Storage
2002	Ahmed Amer	Primary	Predictive Data Grouping using Successor Prediction
2002	Tsozen Yeh	Primary	Improving File System Performance with File Access Predictions
2000	Theodore Haining	Primary	Non-volatile Cache Management for Improving Write Response Time with Rotating Magnetic Media
2000	Benjamin Reed	Primary	Using Network Attached Storage in a Secure Network Distributed File System
2000	Randal Burns	Primary	Data Management in a Distributed File System for Storage Area Networks
2000	Thomas Kroeger	Primary	Modeling File Access Patterns to Improve Caching Performance
1992	Richard Golding	Primary	Weak-consistency Group Communication and Membership

Doctor of Philosophy Dissertation Reading Committee

Degree Year	Name	Relationship	Advisor	Institution
—	Oceane Bel	Advisor	Prof. Darrell Long	UCSC
—	Devashish Purandare	Member	Prof. Ethan Miller	UCSC
—	James Hughes	Member	Prof. Darrell Long	UCSC
2019	Judith Samson	Member	Prof. Bradley Smith	UCSC
2019	Yuanjiang Ni	Member	Prof. Ethan Miller	UCSC
2019	Sinjoni Mukhopadhyay	Advisor	Prof. Darrell Long	UCSC
2019	James Byron	Member	Prof. Ethan Miller	UCSC
2019	Daniel Bittman	Member	Prof. Ethan Miller	UCSC
2015	Rekha Pitchumani	Member	Prof. Ethan Miller	UCSC
2015	D.J. Capelis	Member	Prof. Darrell Long	UCSC
2015	Alexandra Holloway	Advisor	Prof. Darrell Long	UCSC
2016	Raja Haddad	Président du jury	Witold Litwin	Université Paris–Dauphine
2015	Rekha Pitchumani	Member	Prof. Ethan Miller	UCSC
2014	Yangwook Kang	Member	Prof. Ethan Miller	UCSC
2014	Andrej Tolič	Member	Prof. Andrej Brodnik	University of Ljubljana
2013	Hanafi Yakouben	Membre du jury	Prof. Witold Litwin	Université Paris–Dauphine
2009	Karen Glocer	Member	Prof. Manfred Warmuth	UCSC
2009	Kevin Greenan	Member	Prof. Ethan Miller	UCSC
2009	Mark Storer	Member	Prof. Ethan Miller	UCSC
2007	Timothy Bisson	Member	Prof. Scott Brandt	UCSC
2007	John Colby	Member	Prof. Geoffrey Pullum	UCSC
2007	Dean Hildebrand	Member	Prof. Peter Honeyman	University of Michigan
2006	Zachary Peterson	Member	Prof. Randal Burns	Johns Hopkins University
2006	Feng Wang	Member	Prof. Scott Brandt	UCSC
2006	Caixue Lin	Member	Prof. Scott Brandt	UCSC
2005	Reiner Kraft	Member	Prof. Raymie Stata	UCSC
2005	Qin Xin	Member	Prof. Ethan Miller	UCSC
2005	Scott Banachowski	Member	Prof. Scott Brandt	UCSC
2004	Ismail Ari	Member	Prof. Ethan Miller	UCSC
2004	Dmitrii Zagorodnov	Member	Prof. Keith Marzullo	UCSD
2003	R. Kameshwari	Member	Prof. K. Gopinath	IIS Bangalore
2003	Bradley Smith	Member	Prof. J.J. Garcia-Luna	UCSC
2002	Brian Chess	Member	Prof. F. Joel Ferguson	UCSC
2002	Jyoti Raju	Member	Prof. J.J. Garcia-Luna	UCSC
1999	Rodrigo Garcés	Member	Prof. J.J. Garcia-Luna	UCSC
1999	Clay Shields	Member	Prof. J.J. Garcia-Luna	UCSC
1998	Bruce Montague	Member	Prof. Charles McDowell	UCSC
1996	Shree N. Murthy	Member	Prof. J.J. Garcia-Luna	UCSC
1996	Eric Rosen	Member	Prof. Patrick Mantey	UCSC
1995	Yuxia Zhang	Member	Prof. J.J. Garcia-Luna	UCSC
1993	Daniel Edelson	Member	Prof. Ira Pohl	UCSC
1993	Max Copperman	Member	Prof. Charles McDowell	UCSC

Doctor of Philosophy Qualifying Committee

Year	Name	Relationship	Advisor	Institution
2020	Shreyas Kumar	Member	Prof. Darrell Long	UCSC

2020	Devashish Purandare	Chair	Prof. Ethan Miller	UCSC
2020	James Hughes	Chair	Prof. Darrell Long	UCSC
2018	Judith Samson	Member	Prof. Bradley Smith	UCSC
2018	Trevor Pesout	Outside Member	Prof. Darrell Long	UCSC
2018	Yuanjing Ni	Chair	Prof. Ethan Miller	UCSC
2018	Sinjoni Mukhopadhyay	Member	Prof. Darrell Long	UCSC
2018	James Byron	Chair	Prof. Ethan Miller	UCSC
2018	Daniel Bittman	Chair	Prof. Ethan Miller	UCSC
2018	Oceane Bel	Member	Prof. Darrell Long	UCSC
2014	Preeti Gupta	Chair	Prof. Ethan Miller	UCSC
2012	Yangwook Kang	Chair	Prof. Ethan Miller	UCSC
2012	Rekha Pitchumani	Chair	Prof. Ethan Miller	UCSC
2012	Ian Adams	Chair	Prof. Ethan Miller	UCSC
2011	Avani Wildani	Chair	Prof. Ethan Miller	UCSC
2008	Neerja Bhatnagar	Chair	Prof. Ethan Miller	UCSC
2008	Kevin Greenan	Chair	Prof. Ethan Miller	UCSC
2008	Andrew Leung	Chair	Prof. Ethan Miller	UCSC
2007	Purvi Shah	Member	Prof. Jehan-François Pâris	University of Houston
2007	Mark Storer	Chair	Prof. Ethan Miller	UCSC
2006	David Essary	Member	Prof. Ahmed Amer	University of Pittsburgh
2005	Karen Glocer	Member	Prof. Manfred Warmuth	UCSC
2004	Reiner Kraft	Chair	Prof. Raymie Stata	UCSC
2003	Scott Banachowski	Chair	Prof. Scott Brandt	UCSC
2003	Qin Xin	Chair	Prof. Ethan Miller	UCSC
2003	Lawrence You	Member	Prof. Darrell Long	UCSC
2003	Feng Wang	Chair	Prof. Scott Brandt	UCSC
2003	Dmitrii Zagorodnov	Member	Prof. Keith Marzullo	UCSD
2003	Bo Hong	Member	Prof. Darrell Long	UCSC
2002	Ismail Ari	Chair	Prof. Ethan Miller	UCSC
2002	Bradley Smith	Chair	Prof. J.J. Garcia-Luna	UCSC
2001	Tsozen Yeh	Member	Prof. Darrell Long	UCSC
2001	Aman Shaikh	Member	Prof. Anujan Varma	UCSC
2000	Brian Chess	Chair	Prof. F. Joel Ferguson	UCSC
2000	Ahmed Amer	Member	Prof. Darrell Long	UCSC
1999	Srinivas Vutukury	Member	Prof. J.J. Garcia-Luna	UCSC
1999	Jyoti Raju	Member	Prof. J.J. Garcia-Luna	UCSC
1998	Marcelo Spohn	Member	Prof. J.J. Garcia-Luna	UCSC
1998	Gil Fuchs	Member	Prof. Robert Levinson	UCSC
1998	Benjamin Reed	Member	Prof. Darrell Long	UCSC
1997	Thomas Kroeger	Member	Prof. Darrell Long	UCSC
1997	Thomas Clay Shields	Member	Prof. J.J. Garcia-Luna	UCSC
1997	Steven Carter	Member	Prof. Darrell Long	UCSC
1997	Brian Levine	Member	Prof. J.J. Garcia-Luna	UCSC
1997	Brian Chess	Member	Prof. F. Joel Ferguson	UCSC
1996	Lampros Kalampoukas	Member	Prof. J.J. Garcia-Luna	UCSC
1996	Hans-Peter Dommel	Member	Prof. J.J. Garcia-Luna	UCSC
1996	Fumiaki Kamiya	Member	Prof. Allen Van Gelder	UCSC
1996	Dirk Coldeway	Member	Prof. Charles McDowell	UCSC
1996	Bruce Montague	Member	Prof. Charles McDowell	UCSC
1995	Theodore Haining	Member	Prof. Darrell Long	UCSC
1995	Shree N. Murthy	Member	Prof. J.J. Garcia-Luna	UCSC

1995	Jochen Behrens	Member	Prof. J.J. Garcia-Luna	UCSC
1995	Dimitrios Stiliadis	Member	Prof. Anujan Varma	UCSC
1995	Chane Fullmer	Member	Prof. J.J. Garcia-Luna	UCSC
1994	Gil Fuchs	Member	Prof. Robert Levinson	UCSC
—	Tsozen Yeh	Member	Prof. Darrell Long	UCSC
—	Thomas Shields	Member	Prof. J.J. Garcia-Luna	UCSC
—	Steven Carter	Member	Prof. Darrell Long	UCSC
—	Shree Murthy	Member	Prof. J.J. Garcia-Luna	UCSC
—	Sage Weil	Member	Prof. Scott Brandt	UCSC
—	Richard Golding	Member	Prof. Darrell Long	UCSC
—	Randal Burns	Member	Prof. Darrell Long	UCSC
—	Max Copperman	Member	Prof. Charles McDowell	UCSC
—	Marcelo Spohn	Member	Prof. J.J. Garcia-Luna	UCSC
—	Lawrence You	Member	Prof. Darrell Long	UCSC
—	Kjell Post	Member	Prof. Allen Van Gelder	UCSC
—	Ignacio Solis	Member	Prof. J.J. Garcia-Luna	UCSC
—	Ignacio Corderi	Member	Prof. Darrell Long	UCSC
—	Gil Fuchs	Member	Prof. Robert Levinson	UCSC
—	Fumiaki Okushi	Member	Prof. Allen Van Gelder	UCSC
—	Eric Rosen	Member	Prof. Patrick Mantey	UCSC
—	Dirk Coldewey	Member	Prof. Charles McDowell	UCSC
—	Dimitrios Stiliadis	Member	Prof. J.J. Garcia-Luna	UCSC
—	David Pease	Member	Prof. Darrell Long	UCSC
—	Chane Fullmer	Member	Prof. J.J. Garcia-Luna	UCSC
—	Brian Levine	Member	Prof. J.J. Garcia-Luna	UCSC
—	Bo Hong	Member	Prof. Scott Brandt	UCSC
—	Benjamin Reed	Member	Prof. Darrell Long	UCSC
—	Aman Shaikh	Member	Prof. J.J. Garcia-Luna	UCSC
—	Ahmed Amer	Member	Prof. Darrell Long	UCSC

Master of Science

Degree Year	Name	Relationship	Thesis
2015	Ignacio Corderi	Primary	RESAR: A System for a Two-Failure Tolerant, Self-Adjusting Million Disk Storage Cluster
2014	Erik Steggall	Primary	Sleuthkit: XTAF extension
2014	Michael McThrow	Primary	Extended Metadata and File System Design: Designing File Systems that Take Advantage of Rich Metadata
2013	Sonali Somyalipi	Primary	Impact of Differential Compression and Deduplication on Genomic Data Storage
2012	Akhilesh Bhargav Malavalli	Primary	Improved Measurement of Backup Reconstruction Performance for a Deduplicated System
2010	Stephanie Jones	Primary	On-line Deduplication in a Log-Structured File System for Primary Storage
2008	Rosie Wacha	Primary	Data Reliability Techniques for Specialized Storage Environments
2007	Kristal Pollack	Primary	Quota Enforcement for High-Performance Distributed Storage Systems
2005	Jeffrey Rybczynski	Primary	Active Workload Reshaping to Maximize Disk Energy Conservation
2005	Jörg Meyer	Primary	Large Scale Multi-Type Inverted List Indexing
2004	Svetlana Kagan	Primary	Using Containers for Efficient Storage of Small Files in the Deep Store Archival System
2004	Karl Brandt	Primary	Using Multiple Experts to Perform File Prediction
2003	Ian Brown	Primary	Upgrading NFS File Servers in a Live Environment
2003	Karen Glocer	Primary	The Utility of Fine-Grained Workload Characterizations
2002	Ying Lin	Primary	Power Conservation Strategies for MEMS-Based Storage Devices
2002	Zachary Peterson	Primary	Data Placement for Copy-on-Write Using Virtual Contiguity
2000	Pu Yang	Primary	Modeling Probe Based Data Storage Devices
2000	A. David McNab	Primary	Extensible UNIX Access Control Lists
1999	John Colby	Primary	Error Correction for Incremental LR Parsers
1998	Tracey Sconyers	Primary	An Examination of Power Consumption in Wireless Modems
1997	Randal Burns	Primary	Differential Compression: A Generalized Solution for Binary Files
1996	Thomas Kroeger	Primary	Predicting File System Actions From Reference Patterns
1994	David Schreiber	Primary	A Code Generator for the PowerPC 601
1994	Chane Fullmer	Primary	Implementation of Adaptive Flow Control Mechanism to the Swift Redundant Distributed File Architecture
1993	Michelle Abram	Primary	Transparent Remote Procedure Calls
1993	Kulumani B. Sriram	Primary	A Study of the Reliability of Hosts on the Internet
1993	Cheng Tang	Primary	A Transport Mechanism for Supporting Multimedia Traffic in ATM Networks
1992	William Osser	Primary	Automatic Process Selection for Load Balancing
1992	Carol Osterbrock	Primary	A Transport Level Protocol for Guaranteed Performance in a Local Area Network
1991	Richard Golding	Primary	Accessing Replicated Data in a Large Scale Distributed System

Master of Science Thesis Reading Committee

Year	Name	Relationship	Advisor
2018	Isaak Cherdak	Chair	Prof. Ethan Miller
2018	Matthew Bryson	Member	Prof. Ethan Miller
2018	Oceane Bel	Chair	Prof. Darrell Long
2018	Austen Barker	Chair	Prof. Darrell Long
2017	Preeti Gupta	Chair	Prof. Darrell Long
2015	Xiaoyuan Lu	Member	Prof. Darrell Long
2015	Ignacio Corderi	Chair	Prof. Darrell Long
2011	Nathan Edel	Member	Prof. Ethan Miller
2010	Kiren Jin	Member	Prof. Ethan Miller
2004	Narayan Brooks	Member	Prof. Suresh Lodha
2003	David Pease	Member	Prof. Richard Hughey
2002	Reiner Kraft	Member	Prof. Raymie Stata
2002	Feng Wang	Member	Prof. Scott Brandt
2002	Alicia Szczurowska	Member	Prof. Scott Brandt
2000	Paul Caamano	Member	Prof. Charles McDowell
1999	Manosiz Bhattacharrya	Member	Prof. Charles McDowell
1998	Christina Parsa	Member	Prof. J.J. Garcia-Luna
1998	Jyoti Raju	Member	Prof. J.J. Garcia-Luna
1997	Bradley Smith	Member	Prof. J.J. Garcia-Luna
1997	Michael Allen	Member	Prof. Charles McDowell
1997	Bruce Sherrod	Member	Prof. David Helmbold
1996	Brian Levine	Member	Prof. J.J. Garcia-Luna
1996	Thomas Clay Shields	Member	Prof. J.J. Garcia-Luna
1996	Catherine Wilson	Member	Prof. Suresh Lodha
1995	Brian Chess	Member	Prof. F. Joel Ferguson
1994	Shree N. Murthy	Member	Prof. J.J. Garcia-Luna
1993	Theodore Haining	Member	Prof. Charles McDowell
1993	Rock Pfotenhauer	Member	Prof. Ira Pohl
1993	Richard Snyder	Member	Prof. Robert Levinson
1991	Matthew Breaden	Member	Prof. Tracy Larrabee
1990	Max Copperman	Member	Prof. Charles McDowell
1990	Daniel Edelson	Member	Prof. Ira Pohl
1990	Frank Jas	Member	Prof. Karl Schimpf
1989	James Kerr	Member	Prof. Allen Van Gelder

Bachelor of Science

Degree Year	Name	Relationship	Thesis
2019	Yash Gupta	Primary	Artifice: A Deniable Steganographic File System
2016	Daniel Bittman	Primary	Designing a Wait-free MPSC Queue
2011	Sulimon Sattari	Primary	A Cross-Disciplinary Data Sharing and Querying Platform for Earth Science Data
2001	Christopher Benson	Primary	Peer-to-Peer File System using Weak Consistency Replication
1994	Sean Gilligan	Primary	MacMet: A Macintosh Program to Display Real-Time and Historical Data from Meteorological Stations
1992	Nitin Ganatra	Primary	Census: Collecting Host Information on a Wide Area Network
1991	Aaron Emigh	Primary	The Swift Architecture: Anatomy of a Prototype
1989	Leland Wallace	Primary	Font Extensions to the **X**-Fig Graphics Program

Case Name	Patent	Case or IPR No(s).	Location	Type	Represented	Law Firm
Intellectual Ventures I LLC and Intellectual Ventures II LLC v. Hewlett Packard Enterprise Company		21-cv-596-ADA 21-cv-1298-ADA 22-cv-703	W.D. Tex.	Litigation	Hewlett Packard Enterprise Company	DLA Piper
Intellectual Ventures I LLC and Intellectual Ventures II LLC v. Hewlett Packard Enterprise Company		21-cv-226-ADA	N.D. Cal.	Litigation	Hewlett Packard Enterprise Company	DLA Piper
Intellectual Ventures I LLC and Intellectual Ventures II LLC v. Hewlett Packard Enterprise Company		22-cv-00730-UNA,	D. Del.	Litigation	Hewlett Packard Enterprise Company	DLA Piper
Longitude Licensing Ltd. and Longitude Flash Memory Systems S.A.R.L. v. Apple Inc.		14-CV- 04275-EDL (terminated 2016)	N.D. Cal.	Litigation	Apple Inc.	DLA Piper
ServStor Technologies LLC v. Hewlett Packard Enterprise Company		2:23-cv-00182-JRG-RSP	E.D. Tex.	Litigation	Hewlett Packard Enterprise Company	DLA Piper
Databricks, Inc. v. Byteweavr, Inc.	US 6,839,733 US 7,949,752	IPR2025-00714 IPR2025-00715	PTB	IPR	Databricks, Inc.	ĕrise IP
WAG Acquisition LLC v. The Walt Disney Company et al.		CDCA-2-21-cv-08230	C.D. Cal.	Litigation	The Walt Disney Company, Disney Streaming Services LLC, and Hulu LLC	DLA Piper
Mirror Imaging LLC	US 9,928,275	21-cv-08230)	PTAB	IPR	Unified Patents, LLC	Duane Morris LLP
SynKloud Technologies LLC	US 9,098,526	IPR2019-01655	PTAB	IPR	Unified Patents, LLC	Duane Morris LLP
Enova Technology LP v. Seagate Technology LLC		13-cv-01011-LPS	D. Del.	Litigation	Seagate Technology LLC	Faegre & Benson LLP
NetApp, Inc. and Hewlett-Packard Enterprise Company v. KOM Software, Inc.		IPR2019-00591 IPR2019-00592 IPR2019-00601 IPR2019-00603	PTAB	IPR	NetApp, Inc. and Hewlett-Packard Enterprise Company	Finnegan, Henderson, Farabow, Garrett & Dunner, LLP
Apple, Inc. v. Seven Networks LLC		IPR2020-00279 IPR2020-00266	PTAB	IPR	Apple Inc.	Fish & Richardson P.C.
Baxter Healthcare v. Fresenius Medical Care Holdings, Inc. & Fresenius USA		20-cv-351	D. Del.	Litigation	Fresenius Medical Care Holdings, Inc. & Fresenius USA	Fish & Richardson P.C.
Collaborative Agreements LLC v. Adobe Systems, Inc., et al.		14-cv-0356-LY (terminated 2017)	W.D. Tex.	Litigation	Adobe Systems, Incorporated	Fish & Richardson P.C.
Communications Technologies Inc. v. Samsung Co., LTD and Samsung Electronics America, Inc.		21-cv-444	E.D. Tex.	Litigation	Samsung Co., LTD and Samsung Electronics America, Inc.	Fish & Richardson P.C.
Kingston v. SecureWave	US 7,036,020	IPR2019-00494	PTAB	IPR	Kingston Technology Company, Inc.	Fish & Richardson P.C.
Microsoft Corp. v. MediaPointe, et al.		2:22-cv-1009	C.D. Cal.	Litigation	Microsoft Corporation	Fish & Richardson P.C.
Microsoft Corporation v. St. Clair Intellectual Property Consultants, Inc.		10-cv-282-LPS (terminated 2016)	D. Del.	Litigation	Microsoft Corporation	Fish & Richardson P.C.
Parallel Networks Licensing, LLC v. Microsoft Corporation		13-cv-02073-SLR-SRF	D. Del.	Litigation	Microsoft Corporation	Fish & Richardson P.C.
R.N Nehushtan Trust Ltd. v. Apple Inc.		22-cv-01832	N.D. Cal.	Litigation	Apple Inc.	Fish & Richardson P.C.
Symantec Corporation v. Acronis, Inc.		11-cv-5310-EMC	N.D. Cal.	Litigation	Acronis, Inc.	Fish & Richardson P.C.
TV Interactive Data Corporation v. Microsoft Corporation		02-cv-02385-SBA	N.D. Cal.	Litigation	Microsoft Corporation	Fish & Richardson P.C.
Xpoint Technologies v. Farstone Technology Inc. et al.		09-cv-0026	D. Del.	Litigation	Microsoft Corporation	Fish & Richardson P.C.
Xpoint Technologies, Inc. v. Cypress Semiconductor Corporation, et al.		09-cv-0628-SLR	D. Del.	Litigation	Cypress Semiconductor Corporation	Fish & Richardson P.C.
Xpoint Technologies, Inc. v. Microsoft Corp., et al.		09-cv-0628-SLR	D. Del.	Litigation	Microsoft Corporation	Fish & Richardson P.C.
Oasis Research, LLC v. Carbonite, Inc.		10-cv-435-ALM (terminated 2016)	E.D. Tex.	Litigation	Carbonite, Inc.	Foley & Lardner LLP
Actifio. Inc. v Rubrik.Inc..		20-cv-00886-CFC	D. Del.	Litigation	Rubrik, Inc.	Gibson, Dunn & Crutcher LLP
CommVault Systems, Inc. v. Rubrik Inc.		20-cv-00524-MN	D. Del.	Litigation	Rubrik Ink.	Gibson, Dunn & Crutcher LLP
Sonrai Memory Limited v. Western Digital Technologies, Inc.		21-cv-1040 transferred to 6:21-cv-1168	C.D. Cal. Transferred to W.D. Tex.	Litigation	Western Digital Technologies, Inc.	Gibson, Dunn & Crutcher LLP
Byteweavr, LLC v. Cloudera, Inc		24-cv-00261	W.D. Tex.	Litigation	Cloudera, Inc	Gibson, Dunn & Crutcher LLP
Spex Technologies, Inc. v Western Digital Corporation, Western Digital Technologies, Inc., HGST, Inc.		16-cv-01799	C.D. Cal.	Litigation	Western Digital Corporation, Western Digital Technologies, Inc., HGST, Inc.	Gibson, Dunn & Crutcher LLP
CommVault Systems, Inc. v. Cohesity Inc.		1:20-cv-00525	D. Del.	Litigation	Cohesity Inc.	Jones Day
BJ's Wholesale Club Holdings, Inc. v. Walmart Apollo, LLC		IPR2022-01496 IPR2022-01509	PTAB	IPR	Walmart Apollo, LLC	Jones Day
Proxyconn, Inc. v. Microsoft Corporation et al.		8:16-cv-01102-DOC-JPR	C.D. Cal.	Litigation	Microsoft Corporation	Klarquist
Teradata Corporation v. SAP SE	US 9,851,923 US 9,720,623 US 7,185,000	IPR2021-00861 IPR2021-00863	PTAB	IPR	SAP SE	Klarquist
Teradata Corporation v. SAP SE	US 7,421,437 US 7,437,516	IPR2020-00939 IPR2020-00940	PTAB	IPR	SAP SE	Klarquist
VirtaMove Corp. v. Amazon.com, Inc., Amazon.com Services, LLC, and Amazon Web Services, Inc.		7:24-cv-00030	W.D. Tex.	Litigation	Amazon	Knobbe Martens
Delphix Corp. v. Actifio Inc.		5:13-cv-04616	N.D. Cal.	Litigation	Actifio, Inc.	Latham Watkins
Cassiopeia IP LLC	US 7,322,046	IPR2020-00111	PTAB	IPR	Unified Patents, LLC	Lee & Hayes PC
BillJCo, LLC	US 8,761,804	IPR2022-00426	PTAB	IPR	Cisco Systems, Inc., Apple Inc., Hewlett Packard Enterprise Co., Aruba Networks, LLC	Merchant & Gould, P.C., DLA Piper, and Greenberg Traurig, LLP
Aylo Premium Ltd, Aylo Freesites Ltd, Aylo Billing Limited, and Aylo Billing US Corp v. DISH Technologies LLC and Sling TV LLC			Europe	Litigation	Aylo	Mishcon de Reya LLP
USB Bridge Solutions LLC v. Buffalo Inc. and Buffalo Americas, Inc.		17-cv-1158-LY	W.D. Tex.	Litigation	Buffalo Inc. and Buffalo Americas, Inc.	Morrison & Foerster L.L.P.
KOM Software Inc. v. NetApp, Inc. et al.		1:18-cv-00160-RGA	D. Del.	Litigation	NetApp, Inc.	Morrison & Foerster L.L.P.
StreamScale, Inc. v. Cloudera, Inc. et al.		21-cv-00198-ADA	W.D. Tex.	Litigation	Cloudera, Inc.	Pillsbury Winthrop Shaw Pittman LLP
Concurrent Ventures/XtreamEdge v. Advanced Micro Devices/Pensando Systems		1:24-cv-335	W.D. Tex.		AMD	Sheppard Mullin
Polaris	US 8,181,042		PTAB	IPR	Unified Patents, LLC	Unified Patents, LLC
Qprivacy	US 11,816,249		PTAB	IPR	Unified Patents, LLC	Unified Patents, LLC
Byteweavr, LLC	US 6,862,488		PTAB	IPR	Unified Patents, LLC	Unified Patents, LLC
Backertop Licensing LLC		IPR2022-01438	PTAB	IPR	Unified Patents, LLC	Unified Patents, LLC
Display Tech IPR		IPR2022-00230	PTAB	IPR	Unified Patents, LLC	Unified Patents, LLC
JustService IPR	US 10,476,868	IPR2020-01257	PTAB	IPR	Unified Patents, LLC	Unified Patents, LLC
GoTV	US 8,103,865		PTAB	IPR	Unified Patents, LLC	Unified Patents, LLC
Datanet LLC	US 8,473,478		PTAB	IPR	Unified Patents, LLC	Unified Patents, LLC
Topia Technology, Inc.	US 10,067,942	IPR2022-00782	PTAB	IPR	Unified Patents, LLC	Unified Patents, LLC
SimpliVity Corp. v. Springpath, Inc.		15-cv-13345-TSH (terminated 2018)	D. Mass.	Litigation	Springpath, Inc	Wilmerhale
iMTX Strategic, LLC v. Hulu, LLC		15-cv-00596-JST (terminated 2016)	N.D. Cal.	Litigation	Hulu, LLC	Wilson Sonsini Goodrich & Rosati
iMTX Strategic, LLC v. Netflix, Inc.		15-cv-00597-HSG (terminated 2016)	N.D. Cal.	Litigation	Netflix, Inc.	Wilson Sonsini Goodrich & Rosati
iMTX Strategic, LLC v. Spotify USA Inc.		15-cv-00593-BLF (terminated 2016)	N.D. Cal.	Litigation	Spotify USA	Wilson Sonsini Goodrich & Rosati
iMTX Strategic, LLC v. Vimeo, LLC		15-cv-00592-BLF (terminated 2016)	N.D. Cal.	Litigation	Vimeo, LLC	Wilson Sonsini Goodrich & Rosati
Sterling Computers Corp. v. Microsoft Corp.		1:24-cv-00406	W.D. Tex.	Litigation	Microsoft Corporation	Winston & Strawn, LLP
Proven Networks, LLC v. VMware, Inc.		21-cv-275-ADA	W.D. Tex.	Litigation	VMware, Inc.	Winston & Strawn, LLP
International Business Machines Corporation v. Airbnb, Inc.		20-cv-00351-LPS	D. Del.	Litigation	Airbnb, Inc.	Winston & Strawn, LLP
VMware, Inc. v. Intellectual Ventures I, LLC and Intellectual Ventures II, LLC		IPR2020-00470 & IPR2020-00859	PTAB	IPR	VMware, Inc.	Winston & Strawn, LLP