UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CISCO SYSTEMS, INC. and FORTINET, INC.,
Petitioners,

v.

INFOEXPRESS INC.,
Patent Owner.

IPR2024-00539
U.S. Patent No. 8,051,460

DECLARATION OF AARON R. STRIEGEL, Ph.D.

TABLE OF CONTENTS

Page

I. Introduction 1

II. Professional Background 2

III. Materials Considered 10

IV. Legal Standards 10

A. Obviousness 10
B. Objective Indicia of Non-Obviousness 14

V. Scope of Opinions 15

VI. Summary of Opinions 16

VII. Evidence of objective indicia of non-obviousness demonstrate that even if one combined Krantz with Herrmann, the resulting claimed invention was not obvious. 19

A. Krantz and Herrmann 19
B. The 460 Patent 20
C. CG LAN embodies all Challenged Claims (1–6, 10–14, 16–22, 27, and 29–30) of the 460 Patent 21
D. [redacted] 23

VIII. Conclusion 53

I. Introduction

1. My name is Aaron Striegel, and I have been retained as a technical expert by Saul Ewing LLP, counsel for InfoExpress Inc. ("InfoExpress" or "Patent Owner"), to provide my expert opinions as to objective indicia of nonobviousness (i.e. "secondary considerations") as to four patents, which Petitioners Cisco Systems, Inc. and Fortinet, Inc. have challenged as unpatentable in this and related *inter partes* review proceedings. These patents include U.S. Patent Nos. 7,523,484 (the '484 Patent); 8,051,460 (the '460 Patent); 8,677,450 (the '450 Patent); 8,578,444 (the '444 Patent) collectively, the "Challenged Patents"). These Challenged Patents are also asserted by InfoExpress in related, co-pending district court litigations against Petitioners.[1]

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[1] *InfoExpress Inc. v. Cisco Systems, Inc.*, Case No. 4:23-cv-2698-YGR (N.D. Cal.); *InfoExpress Inc. v. Fortinet, Inc.*, Case No. 4:23-cv-4389-YGR (N.D. Cal.).

Two other patents—U.S. Patent Nos. 8,347,350 (the '350 Patent); and 8,117,645 (the '645 Patent)—have also been asserted in district court litigation. Petitioners filed IPR petitions against them, but the Board declined to institute those IPRs. *Cisco Systems, Inc. v. InfoExpress Inc.*, IPR2024-00540, Paper No. 13 (PTAB Sept. 24, 2024) (declining to institute review of the '350 Patent) and No. 15 (PTAB Dec. 13, 2024) (denying Petitioners' request for Director Review); *Cisco Systems, Inc. v. InfoExpress Inc.*, IPR2024-00678, Paper No. 14 (PTAB Oct. 11, 2024) (declining to institute review of the '645 Patent) and No. 16 (PTAB Dec. 31, 2024) (denying Petitioners' request for Director Review).

II. Professional Background

2. I have over 20 years of experience working as a Professor of Computer Science with research and development emphases on computer networking, network security devices, enterprise network management, and applied cryptography.

3. I am being compensated at a rate of $575 per hour for time spent on this matter. My compensation is not related in any way to the outcome of this action. I have no financial interest in this matter.

4. In addition to the summary I have provided here, I describe my education and experience in greater detail in my *curriculum vitae* (CV) attached as **Appendix A**. A list of all cases in which, during the last five years, I have testified as an expert at trial or by deposition is attached to this Report as **Appendix B**. In the remaining paragraphs in this section, I have summarized some of the relevant information from my CV.

5. I am currently a Professor in the Department of Computer Science and Engineering at the University of Notre Dame. I received my Ph.D. in Electrical and Computer Engineering in 2002 from Iowa State University in Ames, Iowa. I received my Bachelor's degree in Computer Engineering in 1998 from Iowa State University in Ames, Iowa. I have served in my current role as Professor in the Department of Computer Science and Engineering at the

University of Notre Dame in Notre Dame since May 2018. Prior to that period, I served as an Associate Professor from May 2009 to May 2018, and prior to that as an Assistant Professor (tenure track) from January 2003 through May 2009.

6. From 2012 through 2018, I served as the Associate Chair in the Department of Computer Science and Engineering overseeing junior faculty mentoring, external degree program accreditation via ABET (the professional accreditation body for engineering, including Computer Science via CSAB), and other administrative duties for the department. In 2011 and 2017, I led the reaccreditation of the Computer Science and Computer Engineering programs for the Department of Computer Science and Engineering at the University of Notre Dame with ABET. Furthermore, since 2020, I have served as the Program Director for the Bachelor of Arts in Computer Science which is a joint program between the Department of Computer Science and Engineering and the College of Arts and Letters at the University of Notre Dame.

7. I have published nearly 40 peer-reviewed journal papers and over 100 papers in the areas of computer networking, computer security, engineering education, and real-time systems. Out of those papers, three papers have received best paper awards at conferences. My work has been cited by research papers and other scholarly materials over 4000 times with an h-index of 35 (h papers having been cited at least h times).

8. I have served on numerous Technical Program Committees (TPCs) for top conferences in my field of research. For example, I served as the general chair for ICCCN on its 25th International Conference on Computer Communications and Networks, which was held in August 2016. Most recently, I am currently one of the three Technical Program Committee (TPC) co-chairs for INFOCOM 2025, one of the flagship conferences in computer networking. I have also served on numerous panels and federal grant review efforts. For example, I have previously served on a panel at INFOCOM 2018 concerning the impact of artificial intelligence (AI) on networking research. Prior examples include serving on a panel regarding large-scale instrumentation of mobile devices at CSET 15 (8th Workshop on Cyber Security and Test). In the past few years, I have given a keynote regarding data collection and smart device challenges at the SmartWork workshop in October 2021 and a keynote on network measurement at UEMCON 2022.

9. My research group has produced numerous, large-software artifacts available to researchers and interested parties including code bases across C, C++, C#, Java, MATLAB, Python, Swift, Go, and Tcl. Notable software products produced by our research group include a fully functional agent for Android proximity / communication monitoring (PhoneMonitor, Java), a full visualization suite for network security context (ENAVis, Java, C++), improved

rehabilitation utilizing a combination of the Nintendo Wii balance board and Microsoft Kinect (WeHab, C#), an integrated software suite for capturing smartphone, wearable, and beacon sensing streams (Tesserae, multiple languages), implementations for video streaming utilizing QUIC (Go), and a full network programming suite for layer two to layer seven interactions (ScaleBox, C++). All of the efforts involve multiple years of development and range on the order of thousands to hundreds of thousands of lines of code. I have supervised / am in the process of supervising millions of dollars (over $17M) of funding during my time at the University of Notre Dame for research purposes relating generally to networks, network security, and sensing devices. Funding sources include government agencies (National Science Foundation (NSF), National Institute of Health (NIH), DARPA, and IARPA), private foundations (National Academies / Keck Foundation), and industrial support.

10. I have supervised 17 students through completion of their Ph.D. degrees, nine students through completion of their Masters degrees, and numerous undergraduates conducting research. Primary focus areas of the various dissertations and theses are outlined in my CV and are oriented around my primary areas of research (computer networking, computer security, and computer systems, specifically embedded systems and ubiquitous sensing (Internet of Things)).

11. I have instructed over 30 courses across my time as an instructor between Iowa State University and the University of Notre Dame. Courses have ranged from an introductory course for freshmen on engineering concepts to graduate-level courses on operating systems and security. During that time, I co-taught a MOOC (Massive Online Open Course) to nearly 10,000 students entitled "Understanding Wireless" offered as a joint effort between edX and the University of Notre Dame.

12. I have participated in multiple curriculum revisions including a recasting of the lab of the embedded system course at Iowa State University (C, Assembly), a conversion of the introductory programming sequence at the University of Notre Dame (from Scheme to C/C++), and piloted new courses on computer security, human-computer interaction, graduate networks—also at the University of Notre Dame.

13. I served as a co-PI (Principal Investigator) of the Industrial University Cooperative Research Center (IU/CRC) sponsored by the National Science Foundation at the University of Notre Dame, of which Notre Dame is a site under the Broadband Wireless Applications Center (BWAC). I have participated in considerable industrial outreach including funding from Sprint, Google, Alcatel-Lucent, Hewlett-Packard, and Sun Microsystems. I was a founding member of the Wireless Institute at the University of Notre Dame and

serve as part of the Executive Committee. Past and current collaborators for the Wireless Institute include Sprint, Alcatel-Lucent, InterDigital, National Instruments, the Office of Naval Research, and the Lab for Telecom Sciences.

14. I completed several industrial internships during my graduate and undergraduate work, all with substantive programming roles. In 1996 (January through August), I worked in a cooperative work program with Fisher Controls (now Emerson Process) in Marshalltown, Iowa. In 1997 and 1998 (both May to August), I continued with additional summer internships also at Fisher Controls. The work at Fisher Controls included development in C++ and C supporting GUI development and communications tool development (HART, Fieldbus). In 2000 (May to August), I worked for Architecture Technology Corporation, a small research firm in Eden Prairie, Minnesota. My tasks included development in C++ on a fully functional suite of a network gateway capable of providing DHCP and MobileIPv4 support. In 2002 (January to May), I worked for the Universite de Technologie Compiegne in Compiegne, France in partnership with Motorola. My duties there included the development of a specification for distributed admission control support with C++ and Tcl support for simulation in ns2 for the purposes of mobile resource management. In 2002 (May to August), I worked for Sun Microsystems in Mountain View, California. My duties included the creation of a fully functional emulation testbed for the evaluation of network processors via

Layer 2 through Layer 4 rule bases (for a product dubbed NEON related to an upcoming Sun Blade system) with all code written in Java.

15. During my time as an instructor (both as a Ph.D. student and as a professor), I have drawn extensively on those industrial experiences in teaching the various code and system-oriented classes. I have taught over 11 courses that involved significant aspects of C programming (CSE 20211, CPRE 211, CSE 30341, CSE 60641, over 800 students), four courses that involved significant aspects of object-oriented (CSE 20211, CSE C++, C#) programming (over 150 students), six courses that had significant systems components with considerable C programming (over 225 students, CSE 30341, CSE 30342, CSE 60641), two courses with considerable introductory programming (MATLAB) (800 students, EG 10111), and four courses with robust assembly components (nearly 500 students, CPRE 211). Furthermore, my programming and system notes were published as an open note set. Finally, I have taught three courses centered on networking (CSE 30289, CSE 60744, CSE 60884— one at the undergraduate level, two at the graduate level) and one course on security (CSE 498U— cross-listed between undergraduate / graduate). Cumulatively, I have over 20 years of coding experience (industry, graduate school, faculty member) in C and C++ programming. I have over 20 years of experience with computer networks and over 18 years of experience with computer security topics.

16. Relevant to this particular matter, I have published several works focusing on the security of enterprise networks as well as management of access control with regards to network access. For instance, I published a paper in 2006 the ACM Workshop on Security focusing on access control for a replicated database. Earlier that year (2006), I had also published two works on computer security as well, one at IEEE WCNC that focused on limitations of WPA (Wi-Fi Protected Access) for SOHO (Small Office / Home Office) environments as well as a paper in June 2006 that focused on detecting imbalances in network intrusion datasets. Several years later, I published a work on enterprise network flow visualization (visualizing who / what is accessing the network), specifically related to access and multiple vantage points for visualization for a system named ENAVis (Enterprise Network Activities Visualization). The novel twist of the work was the creation of a novel HUA (Host, Users, Application) graph control allowing visualization and analysis with selected linkages for all or a subset of the HUA information. The work won the best paper award at USENIX LISA (Large Installation System Administration) 2008, one of the premier venues for managing enterprise-style networks. That work also placed second in the National Security Innovation Competition in 2009.

III. Materials Considered

17. In preparing my analysis, I have reviewed the Challenged Patents, the IPR Petitions and supporting exhibits, and the materials cited my declaration.

18. In reaching the opinions expressed in this declaration and conclusions reached, I have also relied on years of education, teaching, research, and experience, and my understanding of the applicable legal principles.

19. My analysis of the materials produced in these IPRs is ongoing. I will continue my review of materials, including any new materials provided to me, or that I discover. Therefore, this declaration represents those opinions I have formed to date, and I reserve the right to revise, supplement, and amend the opinions stated herein based on new information and on my continuing analysis of the materials already considered

IV. Legal Standards

A. Obviousness

20. I have been informed that references that qualify as prior art (under 35 U.S.C. § 102) can individually be a basis for invalidating a patent claim. But, if a single reference (or embodiment therein) does not contain every limitation of a patent claim, it can only serve to invalidate that claim by rendering it obvious

under 35 U.S.C. § 103. To show a patent claim is obvious, one must combine a prior art reference with one or more other prior art references.

21. I have been informed that the analysis of obviousness involves several factual inquiries including the scope and content of the prior art, the differences between the prior art and the claim, and the level of ordinary skill in the art at the time of the invention.

22. I have been informed that the test for analogous art is very specific. I have been informed that art is non-analogous unless it is: (1) from the same field of endeavor as the claimed invention; or (2) reasonably pertinent to the particular problem faced by the inventor. I have been informed that an art citation that is not from the same field of endeavor as a claimed invention must be "reasonably pertinent" to the problem addressed by the inventor. I have been informed that art is "reasonably pertinent" when it would "logically commend itself" to an inventor's attention in considering his problem. Conversely, I have been informed that when art is directed to a different purpose than a claimed invention, one of ordinary skill would have less motivation or occasion to consider it.

23. I have been informed that the fact that prior art references all concern the same field of endeavor is not in itself sufficient rationale for making the combination. Many types of techniques and systems exist in the same field of

endeavor. That fact alone would not make it obvious to combine their features. I have been informed that a proper obviousness determination must show reason why a person of ordinary skill in the art would have thought to combine particular available elements of knowledge, as evidenced by the prior art, to reach the claimed invention.

24. I have been informed that a party seeking to invalidate a patent on obviousness grounds in an IPR must demonstrate by preponderance evidence that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so.

25. I have been informed that to establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art.

26. I have been informed that if the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious.

27. I have been informed that to determine whether a combination of known elements would have been obvious to a person of ordinary skill in the art at the time of the invention, one must consider the references in their entirety to

ascertain whether the disclosures in those references render the combination obvious to such a person.

28. I have been informed that the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. Additionally, I understand that a patent is likely to be invalid for obviousness if a person of ordinary skill in the art can implement a predictable variation or if there existed at the time of the invention a known problem for which there was an obvious solution encompassed by the patent's claims. A combination is not obvious, however, where the combination cannot be implemented without undue experimentation or when the motivation to create the combination comes from hindsight.

29. I have been informed that when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill in the art has good reason to pursue the known options within his or her technical grasp. I understand that, if this leads to anticipated success, it is likely the product not of innovation, but rather of ordinary skill and common sense. I have been informed that the fact that a combination was obvious to try might show that the patent claim was obvious.

30. I have been informed that, even when all claim limitations can be found in a combination of prior art references, the fact-finder must consider as

part of the obviousness determination not only what the prior art teaches, but whether the prior art teaches away from the claimed invention and whether there is a motivation to combine teachings from separate references in the manner claimed. I have been informed that that in order to combine teachings and/or references, one must first provide evidence and reasons showing that one of ordinary skill in the art, at the time of invention, would have been motivated to combine those references. Importantly, one must analyze the reasons for combination at the time of those references, and without relying on hindsight bias.

B. Objective Indicia of Non-Obviousness

31. I have been informed that, in assessing whether a claimed invention is obvious, objective indicia of nonobviousness may weigh towards the non-obviousness of the invention. These objective indicia include the following:

- Whether the claimed invention satisfied a long-felt need;
- Whether the claimed invention was preceded by a history of failures by others to solve a problem or problems solved by such invention;
- Whether the claimed invention achieved a surprising or unexpected result;
- Whether the claimed invention exhibited performance superior to prior art devices and/or methods;
- Whether the claimed invention has achieved commercial success;
- Evidence of industry acquiescence;
- Licenses;
- Whether the claimed invention has been copied;
- Whether the claimed invention was the subject of skepticism by the industry; and

- Whether the prior art taught away from the claimed invention.

32. I understand that the weight accorded to objective indicia of nonobviousness evidence depends on that evidence being reasonably commensurate with the scope of the claims and the existence of a nexus between the merits of the claimed invention and the evidence of objective indicia of nonobviousness.

V. Scope of Opinions

33. I have been asked only to provide my independent opinions and analysis of the issues I specifically discuss in this declaration. I note that the Petition (and the evidence it cites) appears to raise many other issues, but I have not been asked to provide my opinions as to any of those other issues other than those set forth in this declaration.

34. I have reviewed evidence relating to objective indicia of nonobviousness for the ’460 Patent. [redacted]

[redacted] I will explain my analysis on the objective indicia of nonobviousness in more details below.

VI. Summary of Opinions

35. I have been asked to consider and explain the nature and import of objective evidence of non-obviousness in view of the Challenged Claims (i.e. 1–6, 10–14, 16–22, 27, and 29–30) of the 460 Patent. I have also been asked to provide my opinion as to how this objective evidence should be weighed against the evidence that the Petitioners contend to show the claims are unpatentable.

36. It is my opinion that InfoExpress's CG LAN product embodies all Challenged Claims of the 460 Patent. Furthermore, there is strong and compelling objective evidence showing that the patented invention of the 460 Patent (including its embodiment in the CG LAN) (1) solved a long-felt need (2) where others such as Cisco had failed, [redacted]. It is also my opinion, as I explain below, that this evidence is the direct result of the combination of features claimed by claims of the 460 Patent.

37. As to specific claim limitations, and as set forth in greater detail below, my opinion as to the evidence for secondary considerations of nonobvious is summed in the chart below and set forth herein:

Claim Limitations	Claims	Relevant Indicia	Supporting Evidence
"applying a security policy to the access device"	1–6, 10–14, 16–22, 27, and 29–30 (i.e. all Challenged Claims)	Solving a long-felt need; failure of others; industry praise; copying	EX2446 (Tim Greene, *Deceiving Cisco's NAC*, Network World (April 3, 2007)); EX2526 (Paul Roberts, *Black Hat: NAC Solutions Vulnerable to Attack*, Computer World (Aug. 3, 2006)); EX2447 (Hasham Ud-Din Qazi, *Comparative Study of Network Access Control Technologies* (May 11, 2007)); EX2528 (CG LAN announcement dated for May 11, 2004); EX2422 (Jan. 17, 2005, [redacted] EX2471 (March 15, 2005, T. Nakano to S. Lum email); [redacted] EX2480 (Dec. 22, 2004, slide deck); at 6, 8; EX2534 [redacted] EX2497 at 1 (March 21, 2005, schematic); EX2498 (March 21, 2005, cover email from J. Ong (InfoExpress) to S. Lum); EX2537 (schematic); EX2529; EX2500; EX2501; EX2424 (April 2005

Claim Limitations	Claims	Relevant Indicia	Supporting Evidence
			[redacted]); EX2416; EX2504 (March 2006 PowerPoint); EX2530; EX2531; EX2532; EX2533; EX2534; EX2535; EX2536; EX2537; EX2538; EX2539; EX2540; EX2519 ([redacted]).
"obtain[ing] system data" and "using system data"	3–6 and 18–21	Solving a long-felt need; failure of others; industry praise; copying	All evidence cited above with respect to "applying a security policy to the access device"
"monitor[ing]security status of the access device after reconfiguring the communication port . . ."	22	Solving a long-felt need; failure of others; industry praise; copying	EX2525 (Tim Greene, *Burning NAC Questions – Part 2*); EX2447 at 96 (Hasham Ud-Din Qazi, Comparative Study . . .); EX2541 at 2, 13; EX2542 at 26; EX2529 at 6; EX2534 [redacted]); EX2497 at 1 (March 21, 2005, schematic); EX2498 (March 21, 2005, cover email from J. Ong (InfoExpress) to S. Lum); EX2537 (schematic); EX2500 (VM demo procedure); EX2501 (March 28, 2005, J. Ong to T. Nakano cover email); [redacted].

Claim Limitations	Claims	Relevant Indicia	Supporting Evidence
". . . wherein the program is further executable to update the access device when requirements of the security policy are not satisfied"	27	Solving a long-felt need; failure of others; industry praise	EX2469 ([redacted] ; EX2447 at 96 (Hasham Ud-Din Qazi, Comparative Study . . .); EX2474; EX2527 ; EX2480 (Dec. 22, 2004, slide deck) at 8; EX2424 (April 2005 [redacted]).

38. In light of this evidence of secondary considerations of non-obviousness, including (1) a long-felt but unsolved need, (2) the failure of others (e.g. Cisco), (3) industry praise [redacted], my opinion is that the claimed invention was not obvious.

VII. Evidence of objective indicia of non-obviousness demonstrate that even if one combined Krantz with Herrmann, the resulting claimed invention was not obvious.

A. Krantz and Herrmann

39. In this IPR, Petitioners assert as prior art (1) U.S. Publication No. 2004/0111520 A1 to Krantz (EX1005) and U.S. Publication No. 2004/0107360 A1 to Herrmann (EX1006). Krantz is directed to a computer system for automation and provisioning and configuring access a network. Indeed, Krantz explains that for provisioning and configuring access to a network, "any software incompatibilities must be worked out by a user that may lack the technical

expertise or desire to re-configure software for compatibility with the service." EX1005, para. [0013].; Krantz is not directed to network security vis-à-vis the posture of endpoints in that network.

40. Herrmann is directed to a network computing system. Herrmann discloses a two-part login process, whereby "[a] first authentication module establishes a session with a client device requesting network access for collecting information from the client device and determining whether to authenticate the client device for access to the network . . ." EX1006, Abstract. Herrmann further teaches "[a] second authentication module [that] participates in the session with the client device for supplemental authentication of the client device for access to the network . . . based, at least in part, upon the collected information and a policy required as a condition for network access."

B. The 460 Patent

41. The 460 Patent is directed to a novel approach to a security solution for controlling access to a protected network whereby access was governed by not only authentication but also auditing the access device against a security policy. Before InfoExpress's inventions, such a solution required multiple "gatekeepers" placed directly between clients, i.e., users, and the network. EX1001, Fig. 1, 2:41-44. With large corporate networks including many access points, the "use of one instance of GateKeeper 110 to support numerous instances

of Access Device 160 [wa]s limited by bandwidth and required sophistication (e.g., cost) of GateKeeper 110." EX1001, 2:35-38. The gatekeeper then becomes a limiting bottleneck on the bandwidth of the system. EX1001, 2:38-41.

42. The 460 Patent addressed this particular problem with a novel and nonobvious approach that relieves that bottleneck through an out-of-band mechanism which in turn can reconfigure access point(s) for authorized devices to access a protected network. By way of example, the 460 Patent discloses a protected network that includes a restricted subset with a gatekeeper and one or more less-restricted subsets. Before an access device is granted access to a less-restricted subset 210, its request is first passed to the restricted subset (in this embodiment indicated as 205). EX1001, 2:54-56, 5:33-37.

43. A gatekeeper in the restricted subset checks whether the access device satisfies security policies, and if so, the access device is granted access to a less-restricted subset of the protected network. EX1001, 2:56-60. A key feature of the 460 Patent is that rather than require all device access requests to pass through an in-band gatekeeper, the access point is reconfigured by the out-of-band gatekeeper. By reconfiguring the access point, network traffic for certain devices can pass from the access device to the less-restricted subset of the network without needing to pass through the gatekeeper. Thus, after access has been granted, the network traffic does not need to pass through the gatekeeper.

C. CG LAN embodies all Challenged Claims (1–6, 10–14, 16–22, 27, and 29–30) of the 460 Patent.

44. For the purpose of this declaration, I have been asked whether InfoExpress's CG LAN product embodies the claims of the 460 Patent. Based on my review of the claims and the information provided to me in connection with these IPRs my conclusion is that the CG LAN (in particular, the CG LAN as it existed in 2004-06) embodies all Challenged Claims (i.e., 1–6, 10–14, 16–22, 27, and 29–30) of the 460 Patent. The details of my analysis are set forth in **Appendix C**, which is a claim chart in which I set forth my opinions regarding exemplary claims 1, 3–6, 16, 18–22 and 27 of the 460 Patent. These claims are exemplary but not limiting Further, it is my understanding that InfoExpress first commercially sold (and continued to sell) the CG LAN product in or around June 2004. 2024-04-11 InfoExpress's Objections and Responses to Cisco's Second Set of Interrogatories (Nos. 13-14). I do not intend for my statements in **Appendix C** to be weighed any differently than my statements here.

45. Furthermore, it is my opinion that the CG LAN is coextensive with the Challenged Claims of the 460 Patent. The CG LAN's purpose is to "control[] access to [a] network" that includes a restricted VLAN and a less-restricted production VLAN. *See, e.g.*, EX2544 at 6. Furthermore, as shown in **Appendix D**, the 460 Patent claims cover the CG LAN as a whole (and not a mere component thereof). I understand that the CG LAN contains no features that are

critical to its performance, which are apart from, or in addition to, those features recited in the Embodied Claims. I further understand that in addition to the 460 Patent, other of InfoExpress's patents cover its CG LAN, yet this does not alter my opinion that the CG LAN is coextensive with the 460 Patent.

46. In addition to the CG LAN, I also understand that InfoExpress sells another product known as the CGX that practices the claims of the 460 Patent. *See, e.g.*, EX2463; EX2464; EX2466; EX2467; EX2480. I further understand that InfoExpress's CG LAN and CGX products, for the entire time they were offered up to present date, also embody at least the same claims of the 460 Patent for the same reasons that are delineated therein.

D. [redacted]

47. I understand that apart from showing that an embodying product (e.g. the CG LAN) is coextensive to the patent claims, one can link evidence of secondary considerations to the inventive combination of known elements. In other words, I understand that objective evidence need not be tied exclusively to claim elements that are not disclosed in a particular prior art reference. This is known as a "nexus" between the evidence and the claims. My opinion is that the objective evidence demonstrates (1) a long-felt need and (2)

failure of others (namely Cisco), (3) industry praise, and (4) copying—at least as to the claimed combinations recited in the following claims of the 460 Patent:

- Claims 1 and 16 ("applying a security policy to the access device . . ."),
- claims 3 and 18 ("obtain[ing] system data from the access device, and wherein applying the security policy includes using the system data to determine that the access device satisfies the requirements of the security policy"),
- 4 and 19 ("wherein the system data includes antivirus software status"),
- 5 and 20 ("communicat[e/ing] between the gatekeeper and an agent executing on the access device to obtain system data from the access device"),
- 6 and 21 ("wherein the system data includes information regarding devices connected to the access device"),
- 22 ("wherein the program is further executable to communicate between the gatekeeper and an agent executing on the access device to monitor security status of the access device after reconfiguring the communication port for communicating between the access device and the less-restricted subset"), and
- 27 ("wherein the program is further executable to update the access device when requirements of the security policy are not satisfied").

48. Around the time of the invention, others (including Cisco) had tried to create a NAC solution, but fell short. On the other hand, InfoExpress, ***did*** create a functioning NAC product—the CG LAN—that embodied and practiced the claims of its patents, including the 460 Patent. [redacted]

solution from a "mere[] communications broker," (EX2422) to one capable of practicing the claimed invention and reaping the attendant benefits.

(a) Cisco tried but failed to achieve a network access control solution (CNAC).

49. In June 2004, Cisco tried to create its NAC solution—Cisco Network Admission Control ("CNAC"). [redacted] EX2525 (Tim Greene, *Burning NAC Questions – Part 2* (Oct. 17, 2007) (noting that CNAC provided both in-line and out-of-band enforcement)). However, CNAC had several fundamental technological shortcomings.

(i) Auditing by "applying a security policy to the access device," including by "obtain[ing] system data" and "using the system data"

50. Auditing an "access device" or endpoint device (that is, by "applying a security policy to the access device") is a foundational requirement of NAC. A NAC system needs to be able to enforce its security requirements for endpoint devices accessing a protected network.

51. [redacted]

52.

53. Another reason Cisco's NAC solution fell short, was that it could be "deceived" by "phony" audit data, as noted in an article dated 2007:

> Cisco's NAC can be fooled into thinking non-compliant PCs actually meet the security posture NAC is designed to enforce, according to security experts reporting at the Black Hat conference in Europe.
>
> That means Cisco's NAC could admit non-compliant PCs to networks because it can't tell that it is being lied to.
>
> So if a PC tells Cisco's NAC policy server what it needs to hear – that its personal firewall settings are proper; and its antivirus is updated to a certain point; and its operating system is patched to a set level – it will admit the device. ***Cisco's NAC will not know that the data is phony***.
>
> . . . .
>
> Security experts say one point to take away from this is that as a matter of course it is ***ill advised for devices to report on their own state*** for just this reason.

EX2446 (Tim Greene, *Deceiving Cisco's NAC*, Network World's Network Access Control Newsletter (April 3, 2007)).

54. CNAC's susceptibility to being duped by "phony" audit data was noted in other industry publications. *See, e.g.*, EX2526 (Paul Roberts, *Black Hat: NAC Solutions Vulnerable to Attack*); EX2447 at 98 (Hasham Ud-Din Qazi, *Comparative Study* . . .) ("NAC client was demonstrated that lied about its posture assessment and bypassed the NAC. The study was done by analyzing the traffic a CTA generates, and by reverse engineering the CTA.") (citing EX2448 (Thumann and Rocher, *Hacking the Cisco NAC Framework* . . .)). Cisco even acknowledged that "such deceptions [we]re possible," though limited only to "authenticate[d] users." EX2446 at 1 (Tim Greene, *Deceiving Cisco NAC*); *see also* EX2526 at 3

(Paul Roberts, *Black Hat*) (Cisco CSO John Stewart: "The [NAC] technology's immature. . . . Can it be maneuvered to have false data? Yes.").

(ii) Monitoring

55. Additionally, CNAC had no continuous monitoring—as is recited by 460 Patent, claim 22. *See* EX2525 at 1 (Tim Greene, *Burning NAC Questions – Part 2* ("[CNAC] ***does not perform periodic rechecks of devices once they have been admitted to the network*** to make sure they maintain their security posture.")); EX2447 at 96 (Hasham Ud-Din Qazi, Comparative Study . . .) ("Cisco[] NAC, . . . by default do[es] not support post-admission control capabilities, requiring additional components."). Continuous monitoring was and still is a key requirement in NAC. This is because auditing is not a "one-and-done" task; it needs to be ongoing and continuous to ensure the endpoint's compliance with network posture requirements.

56. In contrast to CNAC, CG LAN ***did*** perform "continuous monitoring" e.g. "periodic rechecks" of endpoint devices. [redacted]

[redacted]

(iii) Remediation

57. CNAC lacked ***remediation*** capabilities—which, in the art, refers to bringing a non-compliant endpoint device into compliance. *See, e.g.*, 460 Patent, claim 27 ("the program is further executable to update the access device when requirements of security policy are not satisfied"). [redacted] *see also* EX2447 at 96 (Hasham Ud-Din Qazi, Comparative Study . . .) ("[A]utomatic remediation . . . functionality is immature at the moment. [It] is not achievable in true sense[.]"). In contrast, CG LAN's remediation capabilities were "centralized." *See* EX2469. [redacted])).

(b) [redacted]

58. In December 2004, Cisco formally launched its NAC Partner Program. [redacted]

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Id. at 4.

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EX2424 at 1-2.

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EX2504 at 15.

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EX2504 at 19.

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VIII. Conclusion

86. I declare under penalty of perjury that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true.

Dated: January 13, 2025 By: _____

Aaron R. Striegel, Ph.D.

APPENDIX A

Curriculum Vitae – Aaron D. Striegel

Updated: December 29th, 2024

I. PERSONAL DATA

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https://scholar.google.com/citations?user=w88NouMAAAAJ

II. EDUCATION

- Ph.D., Computer Engineering, Iowa State University Dec. 2002
  Major Professor: Dr. Manimaran Govindarasu
- B.S. Computer Engineering, Iowa State University Dec 1998

III. ACADEMIC EXPERIENCE

- Professor, University of Notre Dame - May 2018 to present
  Program Director, Bachelor of Arts in Computer Science – March 2020 to present
- Associate Professor, University of Notre Dame – May 2009 to May 2018
  Associate Chair - May 2012 to Summer 2018
  Assistant Professor, University of Notre Dame – Jan 2003 to May 2009
  Department of Computer Science and Engineering
- Research Exchange, Université de Technologie de Compiègne – Jan 2002 – May 2002
- Graduate Student, Iowa State University – 1999 - 2002
  Department of Electrical and Computer Engineering

IV. HONORS AND AWARDS

2020 Honorable Mention – Apple Best Paper Award @ WristSense 2020

2014-2016 Leadership Award - ICCCN Service

2013 Best Paper Award - ACM HotPlanet Workshop @ SIGCOMM

2012 National Academy of Engineering Indo-American Frontiers of Engineering Symposium (IAFOE)

Selected Participant, National Academies Keck Futures Initiative (NAFKI), "The Informed Brain in the Digital World"

2011	Best Paper Award - IEEE Healthcom
	National Academy of Engineering Frontiers of Engineering Education Symposium, One of 65 individuals selected nation-wide
2010	Iowa State ECpE Early Career Impact Award
2009	Adviser to 2nd place team – National Security Innovation Competition
2008	Best Paper Award – Large Installation System Administration (LISA) 2008
2006	Notre Dame Computer Science & Engineering Teacher Faculty Award
2003	NSF CAREER Award, 1st Attempt
2002	Iowa State University Research Excellence Award
2001	Faculty Member Nomination (2 students) - Student Scholars and Leaders Recognition Ceremony Participant – NSF Engineering Educators & Scholars Workshop (August 2001) New Faculty Fellow Grant – Frontiers in Education (FIE'2001)
2000	Iowa State University Teaching Excellence Award NSF Graduate Research Fellowship – Honorable Mention
1999	Iowa State University EE/Cpr E Fellowship
Summary:	3x Best Paper Awards 1x Runner Up – Best Presentation Award 2x NAE Symposium (Selected Participant)

V. PROFESSIONAL MEMBERSHIPS

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

Senior Member (2017+), Full Member since 2002, Student Member 98-02

ASSOCIATION OF COMPUTING MACHINERY (ACM)

Full Member since 2006

AMERICAN SOCIETY FOR ENGINEERING EDUCATION (ASEE)

Full Member since 2011

2001 New Faculty Fellow, Frontiers in Education, October 2001.

Academic Honor Societies

Eta Kappa Nu, Tau Beta Pi

VI. TECHNICAL PUBLICATIONS AND PRESENTATIONS

Most publications are available via IEEE Xplore or the ACM Digital Library.

Major Current Projects

Fast Mobile Network Characterization: The goal of the Fast Mobile Network Characterization (FMNC) work is to explore how cleverly constructed packet probing trains can be created to accurately, rapidly, and efficiently capture the link characteristics for various types of wireless links (WiFi, LTE). Current work includes explorations of active and passive approaches to link characterization, the impact of pre-staging on short video, and mechanisms by which active link probing can be leveraged to time shift content for rich, video ads.

Broadband Characterization: A significant recent focus by the federal government has been on improving broadband access to underserved areas. Unfortunately, the measurement of said broadband performance has been problematic with the accuracy of poor performing broadband being often attributed to challenges on the wireless side of access. The focus of this work is to deploy a broad set of sensing nodes across 50+ homes in the South Bend area to better discern the true bottleneck with respect to broadband performance.

Short Video Optimization: Short video has emerged as a dominant form of social media. Unlike longer form videos that can last on the order of tens of minutes to hours, short videos tend to be on the order of tens of seconds at most. This creates significant challenges to normal adaptation mechanisms as well as creating different expectations with regards to the Quality of Experience (QoE) for users. The focus of this work is to create a better understand of what QoE means in the context of short video as well as improved mechanisms for staging, rate selection, and placement of short videos.

Past Major Projects

Privacy Sensitive Contact Tracing: In conjunction with Prof. Taeho Jung who served as PI, we explored privacy preserving primitives that avoid unnecessary information leakage while providing scalability for the purposes of privacy-centric proximity sharing. Our group's contribution included network modeling and sharing past proximity data from NetSense, NetHealth, and Tesserae.

Tesserae: The focus of this project expands on our prior work with NetSense / NetHealth (see below) to explore how smartphones, wearable devices, social media, and context can be used to capture and model workplace productivity. The work has instrumented seven hundred and fifty working professionals in cognitively demanding professions (information work) and instrumented their day-to-day activities over a period of one year. I served as the lead PI with Notre Dame as the lead institution (approx. $10M in total). Eight contributing institutions were a part of the effort (University of California-Irvine, Georgia Tech, Dartmouth, Carnegie Mellon, University of Colorado-Boulder, Ohio State, University of Texas-Austin, University of Washington). The work began in June 2017 and finished in December 2020. A full set of de-identified data was released via the Open Science Framework.

Future of Work: As a follow-on project to Tesserae, we explored whether the same sensing stack could be utilized to explore effective teams with a specific focus on the impact of COVID and remote teaming. The work was funded by the National Science Foundation with the goal of

creating computationally derived mechanisms that can encourage effective team behaviors. The work was a joint work with the University of California-Irvine (Lead) and the University of Colorado-Boulder.

NetSense Smartphone Study: The NetSense smartphone study has instrumented nearly two hundred incoming freshmen at the University of Notre Dame for the purposes of exploring the interplay between smartphone usage (always-on networking) and social ties (make / keep friends). The study has now been gathering data since August of 2011 and is slated to run through May of 2015. My particular focus for this work is with respect to the instrumentation on the device itself (data backend, data security) as well as exploring network usage patterns / optimization efforts. Our current research efforts are focusing on indoor optimization, WiFi offloading, and streamlined content distribution in ultra-dense environments (ex. stadium, dining hall, classroom).

NetHealth Study: The NetHealth study expanded upon the NetSense study to instrument 500 incoming freshmen in the Fall of 2015 with smartphone agents, health sensors (Fitbit Charge HR), and co-location sensing (shared locations). The focus of the work from a sociological perspective was to explore the underlying network effects with regards to homophily on quantitative metrics such as physical activity levels and sleep. The study instrumented over 700 students with rich sensing capabilities and gathered data for students from their freshmen through senior years.

WeHab: The WeHab study explores how low-cost motion-based gaming peripherals (ex. Nintendo Wii Balance Board, Microsoft Kinect) can be used to deliver enhanced balance rehabilitation with applications for post-TBI (stroke, concussion) and orthopedic physical therapy. Our current research efforts are focusing on robust framework development (open source instrumentation platform), audio feedback mechanisms, and predictive modeling for mapping in-therapy results to existing evaluation mechanisms (Berg Balance, FIM).

Lockdown: The Lockdown project focused on visualization of changes in network patterns for the purposes of network security, namely network flows with augmentation of gathered data to include Host, Users, and Applications. Through a novel interface that we dubbed HUA (Host, User, Applications), system administrators could easily add and remove context / edges from network graphs and easily visualize network changes across a variety of views and metrics including graph edit distance, clustering via tools such as walktrap, and various other mechanisms.

Research Summary / Impact

38 peer-reviewed journal papers
100+ peer-reviewed conference / workshop papers
10 invited papers
17 graduated PhD students, 8 completed Masters theses
3 Best Paper Awards
1 Honorable Mention / Runner-Up – Best Paper Award
1 Patent
6 Technology Disclosures

Google Scholar 4300+ citations, h-index 36, i-10 index 96

Journal Publications (Peer-Reviewed)

Students / staff advised / supervised directly by myself are noted in **bold**. The legend for inclusion is as follows: (*) Undergraduates, (@) for Graduate Students, and (+) for Post-doctoral Appointees or past students at a different institution.

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CISCO SYSTEMS, ET AL. v. INFOEXPRESS, INC. [IPR2024-00539]
Page 60 of 91

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3. **@G. J. Martinez**, T. Grover, **+S.M. Mattingly**, G. Mark, S. D'Mello, T. Aledavood, F. Akbar, P. Robles-Granda A. Striegel, "Alignment Between Heart Rate Variability From Fitness Trackers and Perceived Stress: Perspectives From a Large-Scale In Situ Longitudinal Study of Information Workers," *JMIR Hum Factors* 2022; 9(3):e33754 doi: 10.2196/33754
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5. **@G. Martinez**, **+S. Mattingly**, P. Robles-Granda, K. Saha, A. Sirigiri, J. Young, N. Chawla, M. De Choudhury, S. D'Mello, G. Mark, A. Striegel, "Predicting Participant Compliance With Fitness Tracker Wearing and Ecological Momentary Assessment Protocols in Information Workers: Observational Study," *JMIR mHealth and uHealth*, vol. 9, no. 11, November 2021. DOI: 10.2196/22218
6. S. Mirjafari, H. Bagherinezhad, S. Nepal, **@G. J. Martinez**, K. Saha, M. Obuchi, P. G. Audia, N. V. Chawla, A. K. Dey, A. Striegel, A. T. Campbell, "Predicting Job Performance Using Mobile Sensing," *IEEE Pervasive Computing*, October 2021, doi: 10.1109/MPRV.2021.3118570
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8. I. Adjerid, G. Loewenstein, **@R. Purta**, and A. Striegel, "Gain-Loss Incentives and Physical Activity: The Role of Choice and Wearable Health Tools," *Management Science,* May 2021. https://doi.org/10.1287/mnsc.2021.4004
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positions and physical activities," *Applied Network Science*, Dec 2018. DOI: 10.1007/s41109-018-0103-2

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35. A. Striegel, G. Manimaran, "Dynamic Class-Based Queue Management for Scalable Media Servers," *Journal of Systems and Software (JSS),* vol. 66, no. 2, pp. 119-128, June 2003.
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Submissions: No journal papers in submission

Conference / Workshop Publications

1. T. Breideband, R. G. Moulder, **@G. J. Martinez**, M. Caruso, G. Mark, A. D. Striegel, S. D'Mello. 2023. "Location, Location, Location: An Exploration of Different Workplace Contexts in Remote Teamwork during the COVID-19 Pandemic," in *Proc. ACM Human Computer Interaction* 7, CSCW1, Article 71 (April 2023), 22 pages. https://doi.org/10.1145/3579504
2. **@A. Mohammed**, T. Karagioules, E. Halepovic, **@S. Zhu**, A. Striegel, "rePurpose: A Case for Versatile Network Measurement," in *Proc. Of IEEE ICC*, May 2023.
3. T. Breideband, **@G. J. Martinez**, **@P. Talkad Sukumar**, M. Caruso, S. D'Mello, A. D. Striegel, G. Mark. "Sleep Patterns and Sleep Alignment in Remote Teams during COVID-19," in *ACM Human Computer Interaction 6*, CSCW2, Article 326 (November 2022) https://doi.org/10.1145/3555217
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5. **@P. T. Sukumar**, A. Dey, G. Mark, R. Metoyer, A. Striegel, "Triggers and Barriers to Insight Generation in Personal Visualizations," in *Proc. of Graphics Interface*, May 2022.
6. T. Briedeband, **@P. T. Sukumar**, G. Mark, M. Caruso, S. D'Mello, A. Striegel, "Home-Life and Work Rhythm Diversity in Distributed Teamwork: A Study with Information Workers during the COVID-19 Pandemic," in *Proc. of ACM CSCW*, 2022.
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11. K. Saha, T. Grover, **+S. Mattingly**, V. Das Swain, P. Gupta, **@G. Martinez**, P. Robles-Granda, G. Mark, A. Striegel, M. DeChoudhury, "Person-Centered Predictions of Psychological Constructs with Social Media Contextualized by Multimodal Sensing," in *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT)*, March 2021.
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17. **@G. J. Martinez, +S. Mattingly**, S. Mirjafari, S. Nepal, A. Campbell, A. Dey, A. Striegel, "On the Quality of Real-world Wearable Data in a Longitudinal Study of Information Workers," in *Proc. of Workshop on Sensing Systems and Applications Using Wrist Worn Smart Devices (WristSense)*, March 2020.
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[1] IMWUT is nominally the venue for ACM Ubicomp and as such is listed in the Conference / Workshop section. Although structured as a journal, papers follow nominally a conference review process with an opportunity for revisions similar to shepherding.

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26. **@R. Purta**, A. Striegel, "Estimating Dining Hall Usage Using Bluetooth Low Energy Beacons," in *Proc. of UbiMI workshop* at Ubicomp, Maui, Hawaii, September 2017.
27. S. Vhaduri, C. Poellabauer, A. Striegel, O. Lizardo and D. Hachen, "Discovering Places of Interest Using Sensor Data from Smartphones and Wearables," in *Proc. of IEEE UIC (Ubiquitous Intelligence and Computing)*, 2017.
28. **@L. Song**, A. Striegel, "Leveraging Frame Aggregation for Estimating WiFi Available Bandwidth" in *Proc. of IEEE SECON*, San Diego, CA, June 2017 (Acceptance Rate 26.5%)
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35. J. Shi, @**L. Meng**, D. Koutsonikolas, C. Qiao, A. Striegel, G. Challen, "A Walk on the Client Side: Monitoring Enterprise Wifi Networks Using Smartphone Channel Scans," in *Proc. of IEEE INFOCOM*, San Francisco, CA, April 2016 (Acceptance Rate 18.25%).

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49. **@Y. Jiang, @S. Liu**, A. Striegel, "Save For Later: A Technique for Improving End-to-End Mesh Network Performance," in *Proc. of WiMAN (Workshop at ICCCN)*, July 2013.
50. **@S. Liu**, A. Striegel, "Casting Doubts on the Viability of WiFi Offloading," in *Proc. of Cellular Networks: Operations, Challenges, and Future Design (CellNet)*, Helsinki, Finland, August 2012.
51. **@Q. Liao**, A. Striegel, "Intelligent Network Management Using Graph Differential Anomaly Visualization," in *Proc. of IEEE/IFIP Network Operations and Management Symposium (NOMS 2012)*, Maui, HI, 2012.
52. L. Shi, @**Q. Liao**, Y. He, R. Li, A. Striegel, Z. Su, "SAVE: Sensor Anomaly Visualization Engine," in *Proc. of IEEE VAST 2011*, Providence, RI, October 2011.
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55. **@Q. Liao**, A. Striegel, N. Chawla "Visualizing Graph Dynamics and Similarity for Enterprise Network Security and Management," in *Proceeding of the ACM 7th International Symposium on Visualization for Cyber Security (VizSec'10)*, Sept. 2010.
56. Z. Li, @**Q. Liao**, and A. Striegel. "Toward a socially optimal wireless spectrum management", In *Fifth IEEE Workshop on Networking Technologies for Software-Defined Radio and White Space*, held in conjunction with IEEE SECON, Boston, Massachusetts, June 21, 2010.
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84. **@C. Mano**, A. Striegel, "Introducing Security Concepts Through An Electronic Voting Project," in *Proc. Of Frontiers In Education (FIE)*, Indianapolis, IN, Oct 2005.
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99. A. Striegel and G. Manimaran, "A scalable QoS adaptation scheme for media servers," in *Proc. Intl. Workshop on Parallel and Distributed Real-time Systems (WPDRTS)*, pp. 1045-1052, San Francisco, USA, Apr. 2001.
100. A. Striegel, G. Manimaran, "Dynamic Class-Based Queue Management for Scalable Media Servers," in *Proc. IEEE Real-time Technology and Applications Symposium (RTAS),* Washington DC, USA, pp.228-236, May 2000.
101. A. Striegel, G. Manimaran "Best-effort Scheduling of (m,k)-firm Real-time Streams in Multihop Networks," in *Proc. Intl. Workshop on Parallel and Distributed Real-time Systems (WPDRTS)*, Cancun, Mexico, pp. 743-752, Apr. 2000.

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Under Review: ACM SenSys, IEEE ICC

Book Chapters

1. T. J. Neal, D. Woodard, A. D. Striegel, "Mobile device usage data as behavioral biometrics," in Chapter 7 in *Mobile Biometrics*.
2. **@M. Chapple**, A. Striegel, C. Crowell, "Firewall Security Maintenance," in *CT Ethics and Security in the 21st Century: New Developments and Applications*, IGI Global.
3. **@J. M. Wozniak**, A. Striegel, "Investigating Deadline-Driven Scheduling Policy via Simulation with East," to appear as a chapter in *Quantitative Quality of Service for Grid Computing: Applications for Heterogeneity, Large-Scale Distribution and Dynamic Environments*, IGI Global.

Invited Conference Papers

1. **@A. Mohammed**, T. Karagioules, E. Halepovic, **@S. Zhu**, A. Striegel, "On The Harmful Effects of Active Network Probing," in *Proc. of ICCCN*, July 2023.
2. **@G. J. Martinez**, G. Dubrovskiy, **@S. Zhu**, **@A. Mohammed**, H. Lin, J. N. Laneman, A. D. Striegel, R. V. Pragada, D. R. Castor, "An Open, Real-World Dataset of Cellular UAV Communication Properties," in *Proc. of ICCCN*, August 2021.
3. **@S. Zhu, @A. Mohammed**, A. Striegel, "A Frame-Aggregation-Based Approach for Link Congestion Prediction in WiFi Video Streaming," in *Proc. of ICCCN*, August 2020.
4. **@R. Purta**, A. Striegel, "Predicting Friendship Pairs from BLE Beacons Using Dining Hall Visits," in *Proc. of ICCCN*, Valencia, Spain, August 2019.

5. **@L. Song**, A. Striegel, "A Lightweight Scheme for Rapid and Accurate WiFi Path Characterization," in *Proc. of ICCCN*, Hangzhou, China, August 2018.
6. **@X. Hu**, A. Striegel, "PASS: Content Pre-staging through Provider Accessible Storage Service," in *Proc. of ICCCN*, Vancouver, Canada, August 2017.
7. A. Striegel, @**S. Liu, @X. Hu**, "LTE and WiFi: Experiences with Quality and Consumption," in *Proc. of MobiSPC*, August 2014.
8. **@L. Meng, @S. Liu**, A. Striegel, "Characterizing the Utility of Smartphone Background Traffic," in *Proc. of WiMAN*, Shanghai, China, July 2014.
9. **@S. Liu**, A. Striegel, "Accurate Extraction of Face-to-Face Proximity Using Smartphones and Bluetooth," in *Proc. of Fifth International Workshop in Wireless Mesh and Ad Hoc Networks (WiMAN)*, Maui, HI, July 2011.
10. **@C. D. Mano, @D. C. Salyers, @Q. Liao, @A. Blaich**, A. Striegel, "SAABCOT: Secure Application-Agnostic Bandwidth COnservation Techniques", in *Proc. of IEEE BroadNets*, September 2007 (Invited Paper).

arXiv Papers (Non-Refereed)

1. N. Kleber, J. Chisum, A. Striegel, B. Hochwald, A. Termos, J. Laneman, @**Z. Fu**, J. Merritt, " RadioHound: A Pervasive Sensing Network for Sub-6 GHz Dynamic Spectrum Monitoring," posted Oct 2016, https://arxiv.org/abs/1610.06212
2. **@X. Hu**, A. Striegel, "Redundancy Elimination Might Be Overrated: A Quantitative Study on Real-World Wireless Traffic," posted May 2016, http://arxiv.org/abs/1605.04021
3. **@L. Meng**, T. Milenkovic, A. Striegel, "IGLOO: Integrating global and local biological network alignment," posted April 2016, http://arxiv.org/abs/1604.06111
4. **@X. Hu, @L. Song**, A. Striegel, "Is There WiFi Yet? How Aggressive Probe Requests Deteriorate Energy and Throughput," posted Feb 2015, http://arxiv.org/abs/1502.01222

Non-Refereed Conference / Poster Publications

1. **@P. Talkad Sukumar**, D. Reinholz, A. Striegel, "Visualizing Participatory Inequities in Classroom Data," in the VIS 2020 Posters.
2. M. Zia Hydari, I. Adjerid, A. Striegel, "Effect of Gamification on Healthful Activity: The Case of Fitbit Leaderboards," presented at WISE (Workshop on Information System Economics), San Francisco, California, December 2018.
3. M. Zia Hydari, I. Adjerid, A. Striegel, "Effect of Gamification on Healthful Activity: The Case of Fitbit Leaderboards," presented at CHITA (Conference on Health IT and Analytics), Oct. 19-20, 2018, Washington, D.C.
4. N. Kleber, A. Termos, **@G. Martinez**, J. Merritt, B. Hochwald, J. Chisum, A. Striegel, J. Laneman, "RadioHound: A Pervasive Sensing Platform for Sub-6 GHz Dynamic Spectrum Monitoring," demo at *IEEE DySpan 2017*.
5. Yang Yang and Omar Lizardo and Dong Wang and Yuxiao Dong and Aaron D. Striegel and David Hachen and Nitesh V. Chawla, "Gender Differences in Communication Behaviors, Spatial Proximity Patterns, and Mobility Habits," arXiV, https://arxiv.org/abs/1607.06740, 2016.
6. M. Kazjer, C. Crowell, A. Ferreira, J. D'Arcy, @**D. Van Bruggen**, A. Striegel, "Poster: Memorability of Computer Security Posters as Affected by Message Type," at *SOUPS (Symposium on Usable Privacy and Security)*, July 2013.
7. **@M. Chapple**, A. Striegel, J. D'Arcy, "An Analysis of Firewall Rulebase (Mis)Management Practices," *Information Systems and Security Journal*, Jan 2009.
8. **@A. Blaich, Q. Liao**, A. Striegel, D. Thain, "Simplifying Network Management with Lockdown," at *Workshop on Usable IT Security Management (USM '08) – Symposium on Usable Privacy and Security (SOUPS)*, July 2008.

9. **@C. Mano**, A. Striegel, "Demo: Rogue Identifying Packet Payload Slicing via RIPPS," demonstration at *INFOCOM 2008*.
10. A. Striegel, @**D. Salyers, @Y. Jiang, @A. Blaich,** "Improving Medium-Sized Media Clip Distribution Through Transparent Tail Synchronization," extended abstract/poster in *Proc. Of IEEE BroadNets*, Sept. 2007.
11. **A. Blaich, Q. Liao, B. Sullivan, G. Allan**, A. Striegel, D. Thain, "Lockdown: Distributed Policy Analysis and Enforcement within the Enterprise Network," poster at *USENIX Security*, August 2007.
12. **@J. Wozniak**, P. Brenner, D. Thain, A. Striegel, J. A. Izaguirre, "Applying Feedback Control to a Replica Management System," in *Proc. of Southeastern Symposium on System Theory (SSST)*, pp. 472-476, March 2006.
13. **@D. Salyers, @X. Li**, A. Striegel, S. Chandra, "Wireless Stealth Multicast: Bandwidth Conservation for Last-Mile Wireless Clients," poster at *IEEE INFOCOM*, Miami, FL, March 2005.
14. **J. M. Wozniak**, A. Striegel, D. Salyers, J. A. Izaguirre, "Overview of the GIPSE Architecture," poster at *GlobusWorld*, Boston, MA, Feb. 2005.
15. A. Striegel, J. A. Izaguirre, ***M. Shorts, @D. Salyers, *K. McCusker, *B. Bien, *G. Shewakramani**, "Taming the grid management beast with GRIM," poster at GlobusWorld, San Francisco, CA, Jan. 2004.
16. A. Striegel, "Security Issues in a Differentiated Services Internet," *Trusted Internet Workshop - HiPC*, Bangalore, India, Dec. 2002.
17. A. Striegel, C. Reynolds, G. Manimaran, "An integrated heuristic for best effort scheduling of (m,k)-firm streams in point-to-point networks," *FTCS-29 Fast Abstracts,* Madison, WI, USA, June 1999.

Editor - Journals or Books

1. K. Sha, A. Striegel, M. Song, "Advances in Computer Communications: From Green, Mobile, Pervasive Networking, to Big Data Computing," *River Publishers Series* in Communications, 2017. (Selected papers from ICCCN 2015)
2. K. Sha, A. Striegel, M. Song, "Security, Privacy, and Reliability in Computer Communications and Networking," *River Publishers Series in Communications*, 2017. (Selected papers from ICCCN 2015).
3. S. Mao, H. Wang, A. Striegel, K. Sha, "Guest Editorial: Special Issue on Cognitive, Cellular and Mobile Networks," Special Issue in *EAI Endorsed Transactions on Wireless Spectrum*, vol. 2, no. 7, January 2016. (http://eudl.eu/issue/ws/2/7)

Books or Chapters of Books

- Proofreader – "Resource Management in Real-Time Systems and Networks", G. Manimaran, C. Siva Ram Murthy, MIT Press, Apr. 2001

Provisional Patents / Disclosures

- A. Striegel, @**D. Salyers**, @**C. Mano**, @**X. Li**, @,+**Y. Jiang**, "TWiCE: Transparent Wireless Capacity Enhancement," Provisional Patent, #61/628,883, Nov. 2011.
- **@C. Mano**, A. Striegel, "RIPPS: Rogue Identifying Packet Payload Slicing," provisional patent #60/752,945.
- A. Striegel, @**L. Song**, "Rapid End-to-End Path Characterization involving Wireless Network Hops," disclosure on April 19, 2016.
- **@L. Song**, A. Striegel, "Simplified Mechanism for Conveying Residual Capacity at a Wireless Access Point," disclosure on April 19, 2016.

- 2x disclosures on cryptography with Prof. Taeho Jung at Notre Dame on secure contract tracing / computation

Patents

- **@L. Song**, A. Striegel, "Systems and Methods for Rapidly Estimating Available Bandwidth in a WiFi link," Patent #10,383,002, awarded May 2019.
    - https://patents.google.com/patent/US10383002B2/en

Software Artifacts

- *Colocation*: Simplified toolset for detecting co-location (proximity) between multiple individuals for longitudinal interaction monitoring between individuals
- *FMNC:* Fast Mobile Network Characterization
- *MBP-M*: Motion-Based Peripheral Management for open source logging / instrumentation of low-cost gaming peripherals such as the Nintendo Wii and Microsoft Kinect
- *PhoneMonitor*: Agent for monitoring critical phone / digital communications on Android for the NetSense study
- *Scalebox:* Unified framework for bandwidth efficiency and network emulation
- *Lockdown:* Network flow visualization for security
- *PyBluez:* Python toolkit for Bluetooth operations
- *CheapLogger*: Tool for logging full packet payloads at near Gigabit speeds
- *EEOD:* Linux kernel / Apache modifications for TCP explicit end of data as well as underlying packet caching software
- *RIPPS*: Tool for identifying rogue wireless access points (RWAPs)
    - Integrated as part of ScaleBox code base
- *GEMS*: Reliable storage mechanism for storing molecular simulations on the grid of inexpensive host storage devices (hosted on SourceForge)
- *PALM*: C-based implementation of Passive Application Layer Multicast
- *GIPSE*: Toolkit for managing parameter sweep jobs on the grid
- *Libpcap tutorial*: Extensive libpcap tutorial for packet capture / creation
- *East*: Grid resource simulator
- *GenMcast*: Generic framework for multicast simulation in ns-2
- *Tesserae:* Software suite in support of the Tesserae effort including
    - Android, iOS phone agents
    - Automated data ingestion for Qualtrics, Garmin Health API, Gimbal Bluetooth LE beacons
    - User-facing portal and issue management
    - Numerous back-end tools for data integrity management
    - Machine learning toolkits for data analysis
- *Wiilab*: Toolkit for interfacing MATLAB with the Nintendo Wiimote via C# / Bluetooth
- *WiiDoRF*: Toolkit for designing educational modules with Java and the Nintendo Wiimote
- *WeHab*: Stroke / balance rehabilitation
    - Website being migrated to new host

Public Datasets

- Dataset for IMC 2015 paper on WiFi probe requests
    - Posted: October 2015
    - 6x home football game probe request captures - gates + bowl
    - DeBartolo 101

        - https://drive.google.com/folderview?id=0B8WDgYSa7Pe6X1dFd2pCcFRBTU0&usp=sharing
- Dataset for INFOCOM 2016 paper on WiFi scanning (client-side)
    - Posted: March 2016
    - Scans from SUNY-Buffalo and Notre Dame
    - Posted to CRAWDAD
        - http://crawdad.org/buffalo/phonelab-wifi/20160309/
- Tesserae Social Media Corpus
    - Posted: May 2019
    - Available upon request, see https://tesserae.nd.edu/
- Tesserae De-Identified Dataset
    - Posted: January 2021
    - 757 participants, information workers, wearable, phone agent, beacon data from an entire year along with accompanying ground truth
    - Available via request via OSF, see https://tesserae.nd.edu/
- DroneSounder Dataset
    - Posted: May 2021
    - Available via Google Drive – see paper

Popular Press

- Time, "Hitting the Snooze Button May Not Be as Bad as You Think," by Jamie Ducharme, October 31, 2023
    - https://time.com/6329920/snooze-button-sleep-health/
- USA Today, "Fact check: No, cell data used to arrest Idaho suspect doesn't prove '2000 Mules' correct," by Chris Mueller – January 20, 2023
    - https://www.usatoday.com/story/news/factcheck/2023/01/20/fact-check-post-wrongly-links-idaho-death-investigation-2000-mules/11066693002/
- Politifact, "No, cellphone data used to arrest suspected Idaho killer doesn't give '2,000 Mules' credibility," by Tom Kertscher – January 12, 2023
    - https://www.politifact.com/factchecks/2023/jan/12/john-rich/no-cellphone-data-used-to-arrest-suspected-idaho-k/
- Notre Dame Observer: "'We should be sympathetic toward snoozers': Study finds unexpected effect of snoozing an alarm" – September 6, 2022
    - https://ndsmcobserver.com/2022/09/we-should-be-sympathetic-toward-snoozers-study-finds-unexpected-effect-of-snoozing-an-alarm/
- Factcheck.org: Evidence Gaps in '2000 Mules' – Posted June 10, 2022
    - Discussions on the accuracy of geolocation / cellular stie location information
    - https://www.factcheck.org/2022/06/evidence-gaps-in-2000-mules/
- AP News: FACT FOCUS: Gaping holes in the claim of 2K ballot 'mules' – Posted May 3, 2022
    - Discussions on the accuracy of geolocation / cellular site location information
    - https://apnews.com/article/2022-midterm-elections-covid-technology-health-arizona-e1b49d2311bf900f44fa5c6dac406762
- Interview with ABC57 (local ABC affiliate) – Aired October 12, 2020
    - Experts warning consumers of 'scams' ahead of Amazon Prime Day
    - https://abc57.com/news/experts-warning-consumers-of-phishing-schemes-ahead-of-amazon-prime-day
- Podcast on Sciencious Soundwaves – Streamed originally September 2021
    - Discussions on Tesserae, wearables, workplace performance
    - https://open.spotify.com/episode/0Q8TmB8zCL1LWet6ooHhJd
- Interview with WSBT (local CBS affiliated) - Aired February 19th, 2018

    - Overview of Tesserae
    - http://wsbt.com/news/local/notre-dame-studies-how-wearable-trackers-can-make-workers-happier-more-productive
    - Picked up by 9 and 10 in Michigan
        - http://www.9and10news.com/2018/02/20/notre-dame-studies-workplace-satisfaction-participants-activity-trackers/
- Interview with ABC57 on Tesserae
- Interview with WVPE (local NPR affiliate) - February 14, 2018
    - Overview of Tesserae
    - http://wvpe.org/post/notre-dame-researchers-use-wearable-tech-study-workplace-success
- ND Press Release on Tesserae, February 12, 2018
    - https://news.nd.edu/news/researchers-use-wearables-mobile-devices-to-study-workplace-performance/
- Interview with ABC 57 on Alexa / Smart Home Devices - TBA - February 2018
- Engineer for the Soul interview:
    - https://engineerforthesoul.weebly.com/interviews/aaron-striegel
- "Cybersecurity Experts Warn Companies Against Hackers" on WSBT News by Niko Burton, August 10, 2017
- "Special Report: Your attachment to your smartphone could be hurting your family" on WSBT News by Catlin Connin (first appeared on 6 PM news), February 6, 2017
- Internet Radio Show, Global Business on Steroids: The DT Revolution Is Real, hosted by Bonnie D. Graham, http://www.voiceamerica.com/episode/92056/global-business-on-steroids-the-dt-revolution-is-real, May 5th, 2016
- "New technology to provide insights into the health of students," ND Newswire http://news.nd.edu/news/63538-new-technology-to-provide-insights-into-the-health-of-students/
- "Here's the truth about the frightening hacking scenario in Cisco's ads," quoted in Business Insider article by Danielle Muoio, December 3rd, 2015.
- "Student computers face virus threat", The Observer (ND Student Newspaper) http://ndsmcobserver.com/2008/10/student-computers-face-virus-threats/
- Featured Alumni in Iowa State University ECpE Connections on Wii Game Work, Spring 2013 (http://www.ece.iastate.edu/news/alumni-newsletter/)
- Commentary on Anonymous hack of Berrien County Website, WSBT, March 30, 2013 (evening news program via phone interview)
- "Striegel to participate in Frontiers of Engineering Education symposium," ND Newswire, November 2011 http://newsinfo.nd.edu/news/27320-striegel-to-participate-in-frontiers-of-engineering-education-symposium/
- "Wehab: Wii Homework For Stroke Victims," Fast Company, August 2011, http://www.fastcompany.com/1773118/wehab-wii-homework-helps-stroke-victims-heal
- WeHab, Just Before 6 Segment, WNDU, http://www.youtube.com/watch?v=TFjXJ8xPmz0
- "Much more than a game," Notre Dame Newswire, February 2011, http://newsinfo.nd.edu/news/18407/
- "Course innovates with the Wii", The Observer, February 18, 2011, http://www.ndsmcobserver.com/news/course-innovates-with-wii-1.2004571
- "Notre Dame students tie Wii to stroke patient rehab," WSBT, March 4, 2011, http://articles.wsbt.com/2011-03-04/wiihab_28654533

VII. GRANTS AND CONTRACTS

Funded Grants (Active)

- (PI) M. Ghosh, (Co-PI) A. Striegel, Broadband Characterization, Schmidt Foundation, August 2023 - Dec 2024.

Funded Grants (Completed)

- (Co-PI) A. Striegel, "Collaborative Research: FW-HTF-RM: Intelligent Facilitation for Teams of the Future via Longitudinal Sensing in Context," NSF, $1.2M ($600k ND share), Sep 2019 – Sep 2023. (PI @ ND, joint w/UCI, UC-Boulder)
- (PI) A. Striegel, " NeTS: Small: Lightweight, Accurate Network Estimation at the Wireless Edge," NSF, $500k, Aug 2017 - July 2022.
    - Gift from AT&T for $20k - Fall 2022
- (Co-PI) A. Striegel, "RAPID: Longitudinal Modeling of Teams and Teamwork during the COVID-19 Crisis," NSF, $197,667, June 2020 – May 2021 (Lead PI – S. D'Mello at UC-Boulder).
- (Co-PI) T. Jung, A. Striegel, "BLE-based Contact Tracing with Provable Security and Verifiability," IARPA, $200k, Sep 2020 – Aug 2021.
- (PI) A. Striegel (ND), C. Angst (ND), I. Adjerid (VT), T. Milenkovic (ND), R. Metoyer (ND), T. Jung (ND), "NDistance: A Unified Risk Score to Capture Susceptibility Infectiousness and Propensity to COVID," $1M, April 2020 – March 2021.
- (PI) A. Striegel, "Opportunistic Content Pushing from the Network Edge," NSF, $110k, Oct 2017 - Jan 2021.
- (PI) A. Striegel, N. Chawla (ND), S. D'Mello (CU-Boulder), G. Mark (UC-Irvine), M. DeChoudhury (GTech), A. Campbell (Dartmouth), A. Dey (Univ. Washington / CMU), "A Comprehensive Approach to Modeling Job Performance via Unobtrusive, Continuous, Multimodal Sensing," IARPA, approx. $10M (Phase 1, Phase 1 Extension, Phase 2), 6/23/17 - 12/31/20.
- (Site PI) Sub-contract under N. Fox (Maryland) for NIH grant on longitudinal monitoring of at-risk individuals. ND portion was roughly $10k / year for 4 years.
- (Co-PI) J. Laneman, A. Striegel, B. Hochwald, T. Pratt, A. Striegel, "NSF IU/CRC Grant", National Science Foundation, Aug 2014-2019.
    - 2014[2]: $65k NSF, $160k industry, $40k industry (in-kind)
    - 2015: $65k NSF, $120k industry
    - 2016: $65k NSF, $130k industry
- (Co-I) O. Lizardo, D. Hachen, A. Striegel, C. Poellabauer, N. Chawla, "NetHealth: Modeling the Co-Evolution of Social Networks and Health Behaviors," National Institute of Health (NIH) R01, $2.9M, Sep 2014-Aug 2019
- (PI) A. Striegel, J. Laneman, "Stadium Video Pilot," Oct 2015-Sept 2016, IBM, $30k.
    - Spring 2017: Additional $30k
- (PI) A. Striegel, "EAGER: NeTS: Pilot Studies on Proximity for Taming the Wireless Data Tsunami," National Science Foundation, Jan 2015 – August 2015, $49,467.
- (Co-PI) D. Hachen, A. Striegel, J. Liew, "Exploring Passive Voice Monitoring for Emotionality in Social Interactions via Smart Devices," National Academies / Keck Futures Initiative (NAKFI), $100k, May 2013 - April 2015.
- (PI) A. Striegel, C. Poellabauer, D. Hachen, O. Lizardo, "SoCS: Explorations on the Effects of Pervasive Networking on Social Relationships and Resource Planning,"

[2] Award amounts for the IU/CRC Site are based on company memberships at $40k / each.

National Science Foundation, August 2010 – July 2012, $748,825. Cost-sharing ND ($105k), Industrial Support ($300k - Sprint (Aug 2011), $300k - Sprint (Aug 2013))

- (Co-PI) J. Schmiedeler, A. Striegel, C. Crowell, M. Villano, "SHI: Low-Cost Rehabilitation via Gaming Peripherals," National Science Foundation, Sept. 2011 – Aug. 2014 (+1 year No-Cost), $499,000.
- J. Laneman, B. Hochwald, M. Haenggi, A. Striegel, "NSF IU/CRC Planning Grant", National Science Foundation, $15k, April 2013-March 2014.
- (PI) A. Striegel, T. Milenkovic, Google Faculty Research Grant, $35k, March 2013 - February 2014.
- A. Striegel, "Collaborative Data Analysis - NetSense Study," Alcatel-Lucent, $30k, July 2012- June 2013.
- C. Poellabauer, A. Striegel, "REU Site: Experimental Research on Wireless Networking," *National Science Foundation*, $354,628, Jan 2011 – Dec 2013, CNS-1062743.
- A. Striegel, C. Crowell, J. D'Arcy, "TC:Small: A Formal Inter-Disciplinary Study of the Impact of Security Awareness Efforts on User Behavior," NSF, $477,783, Sep 2009 – Aug 2012.
- A. Striegel, A. Chaudhury, C. Crowell, M. Villano, "Curriculum and Laboratory Development Through 3-D Interfacing via the Nintendo Wiimote," NSF, $170,000, Dec 2009 – Dec 2012.
- A. Striegel, Visualization of PCMD / CDR Data, Sprint, July 2011-January 2012, $75k.
- A. Striegel, "Use of a visual feedback with the Nintendo Wii system in rehabilitation of balance among acute stroke patients," Notre Dame Pilot Development, $15,733, Jan 2010 – Dec 2010.
- C. Poellabauer, A. Striegel, "REU Site: Wireless Network Research," May 2008 – Aug 2010, $300k.
- C. Poellabauer, A. Striegel, N. Laneman, "Wireless Mesh Network at Notre Dame," ONR DURIP (Defense University Research Instrumentation Program), equipment grant, $259.874.
- A. Striegel, "CAREER: Transparent Techniques for Bandwidth Conservation," NSF CAREER grant (ANIR) - $435,440, March 2004 – February 2009 (Award No. 0347392)
  REU Supplement: Summer 2005 ($12k), Summer 2006 ($12k), Summer 2007 ($12k), Summer 2008 ($12k)
- C. Poellabauer, A. Striegel, "Mobile WiFi-based Content Sharing," Motorola Labs, $20k, May 2008.
- J. Izaguirre, A. Striegel, J. Peng, "Grid-enabled Integration of Experimental Data for Simulations of Flexible Protein Docking," NSF, $831,884, March 2005 – Feb 2007 plus one year no-cost extension.
  REU Supplement: Summer 2005 ($22k), Summer 2007 ($12k)
- A. Striegel, "SGER: GRIM Core Framework Development," NSF Shared Cyber Infrastructure (SCI), $49,182, June 2004 – May 2005.
  REU Supplement: Summer 2004 ($12k)
- A. Striegel, "TCP/IP Control Plane Enhancements," DARPA, $150,000, sub-contract under Architecture Technology Corporation, Feb 2005 – Jul 2006.
  - Successfully passed performance review – Phase I
- C. Poellabauer, A. Striegel, "IXP Development of Wireless Stealth Multicast," Intel Corporation, $25,000, May 2005.
- A. Striegel, "Trust Inference," Notre Dame Grant, $9.8k, Jan 2007-Dec 2007.

Cumulative Funding: > $17.2M

Project Proposals (pending / under preparation)

- 2x NSF NeTS (Short video, network instrumentation)

Equipment / Software Grants

- A. Striegel, D. Thain, Sun Equipment Grant (AEG) – Thin Clients for Security Validation, $40k
- A. Striegel, D. Thain, "Academic Equipment Grant," Sun Microsystems, $58k.
- A. Striegel, "Itanium2 Initiative at Notre Dame", Hewlett-Packard Itanium2 Initiative - $120k – May 2003
- A. Striegel, "Academic Equipment Grant", Sun Microsystems - $50k – July 2003
- A. Striegel, LANDecoder32 licenses, Architecture Technology Corporation, $6k – Feb 2003.

VIII. TECHNICAL PRESENTATIONS

Keynote Addresses

- Keynote – UEMCON 2022
    - Network Measurement: Great or Good Enough?
- Keynote - 2nd International Workshop on Smart, Personalized and Age-Friendly Working Environments - SmartWork 2021

Panelist / Presenter

- DoD Wearables Summit – August 2020
- INFOCOM 2018 - Machine Learning in Network / Smart Networking
- USENIX CSET 2015 - Experimental Testbeds for Mobile Devices and Large-scale Testing on Mobile Devices
- HotData – Workshop @ ICCCN 2014 – Wireless Big Data
- IEEE CCW 2013 - Panel Organizer - Smartphone Experimentation
- IEEE BroadNets – IP vs. Ethernet in the MAN and WAN

Tutorials

- Tutorial – Mobile IP – Architecture Technology Corporation – August 2000
- A. Striegel, "Security Issues in a DiffServ Internet," tutorial at *CERT'2001*, Omaha, Nebraska, USA.

Invited Talks

- January 2019: Tesserae University of Iowa
- April 2016
    - Industry / University Projects
        - SAP Day @ Notre Dame
- Nov 2015
    - Remote, Accessible Testbeds for Cyber-Physical Systems
        - NSF Workshop - Presented work on NetSense / NetHealth study logistics
- May 2015
    - The Neurodevelopment of Stress Regulation, Social Buffering and Fear Learning Integration and Crosstalk

        - NSF Workshop – Presenting work on Co-Location / Proximity Detection
- Fall 2012
    - "How Computer Gaming Brings Social Justice to Rehabilitation", Hope College
    - "Network Analytics," Sprint Developer Conference (panel w/Sprint, Guavus)
- Summer 2012
    - "How Computer Gaming Brings Social Justice to Rehabilitation", St Pius X University Lecture Series
- Spring 2012: Stroke Rehab Notre Dame Thinks Big
- Summer 2010: Lockdown IBM Research (Beijing)
- Spring 2010: Lockdown Iowa State University
- Fall 2009: Lockdown Hope College
- Spring 2008: ScaleBox Boston Univ., Univ. Kentucky
- Spring 2008: RIPPS Univ. Connecticut, MIT
- Fall 2007: ScaleBox, North Carolina State
- Fall 2004: Stealth Multicast, Michigan State
- Spring 2004: Stealth Multicast, Purdue
- Fall 2003: Stealth Multicast, UIUC

IX. GRADUATE STUDENTS DIRECTED

Doctoral Dissertations Completed

1. Chad Mano: Graduated with Ph.D in summer 2006
   Assistant Professor – Utah State University – Dept. of Computer Science
2. Justin Wozniak, Graduated with Ph. D in spring 2008
   Research Staff – Argonne National Labs – Chicago, IL
3. Dave Salyers, Graduated with Ph. D in summer 2008
   Oracle, Seattle, WA
4. Mike Chapple: Graduated with Ph. D. in summer 2009
   Senior Director, Enterprise Support Services, Univ. Notre Dame
5. Yingxin Jiang: Defended Ph. D in spring of 2010
   Engineer at Google
6. Andrew Blaich: Defended Ph.D. in fall 2010
   Researcher at Lookout Security
7. Qi Liao: Defended Ph. D. in spring of 2011
   Assistant Professor – Central Michigan University
8. Shu Liu: Defended Ph. D. in spring of 2014
   Winner of CSE Grad Student Research Award
   Data Engineer at SalesForce
9. Dirk Van Bruggen: Defended Ph.D in spring of 2014
   Scientist at the Department of Defense
10. Lei Meng: Defended PhD in spring of 2016 (co-advised with T. Milenkovic)
    Engineer at Google
11. Xueheng Hu (started Fall 2011)
    Amazon Lab 126
    PhD Proposal - June 2015
    PhD Defense - Defended in July 2017, Graduated in January 2018
12. Lixing Song (started Fall 2014)
    Assistant Professor, Computer Science, Rose Hulman Institute of Technology
    PhD Proposal – May 2017
    PhD Defense – Summer 2018
13. Rachael Purta (started Fall 2013)
    Masters - Nov 2015

PhD Proposal - August 2016
PhD Defense – Spring 2019

14. Poorna Talkad Sukumar (started Fall 2019 with my group)
    Post-Doc, New York University
    Co-Advised with R. Metoyer
    PhD Defense – August 2021
15. Gonzalo Martinez (started Fall 2016)
    John Deere Credit
    PhD Proposal - Summer 2019
    PhD Defense – Spring 2022
16. Shangyue Zhu (started Fall 2018)
    Central Washington University
    PhD Proposal - May 2021
    PhD Defense - August 2023
17. Alamin Mohammed (started Fall 2018)
    Palo Alto Networks
    PhD Proposal – July 2021
    PhD Defense - October 2023

Masters Theses Completed

1. Xialong Li: Graduated with Masters in summer 2006
   Completed Ph. D University California - Irvine
2. Dave Cieslak – (started Fall 2004) – working on Masters/Ph.D.
   Completed Masters (Spring 2006)
   Research assistant at ND Center for Research Computing
3. Dave Salyers – (started Fall 2003) - working on Masters/Ph.D.
   Completed Masters (Fall 05), See above
4. Qi Liao
   Completed Masters (Fall 2007), See above
5. Dirk Van Bruggen
   Completed Masters (Fall 2012), See above
6. Ben Bockstege
   Completed Masters (Fall 2014)
7. Rachael Purta
   Completed Masters (Fall 2015)
8. Zhongying Qiao (started Fall 2017)
   Completed Masters (Fall 2018)
9. Francis Gatsi (started Fall 2021)
   Completed Masters (Fall 2024)

Current Graduate Students

1. Annapurna Puttaswammy (started July 2022)
2. Saeid Mehrdad (started June 2023)

Past Post-Doctoral Researchers

1. Yingxin Jiang
2. Stephen Mattingly

Current Post-Doctoral Researchers

None

Current Staff (Supported)

None

Past Staff

1. Rae Hoffman – Study Manager (10/18-6/20)
2. Ed Moskal – Project Manager (6/17-6/19)
3. Peter Mycue – Senior Software Engineer (10/17 – 9/18)
4. Scott Null (supported half time in tandem with the Wireless Institute)
5. Katie Cybulski (part-time through Office of Research)

Undergraduate Researchers

2024: J. Benitez, B. Egloff, S. Labrador, R. Paillet, E. Beardmore
2023: C. Whitehouse, G. Nield
2022: C. Ferguson, C. Riley, M. Chaboud,
2021: J. Shen, C. Ferguson
2020: None due to COVID
2019: A. Berjanaro
2018: J. A. Leon, C. Pickard, S. Spencer
2017: K. Dingens, A. Flores, T. Franchetti
2016: B. Byrne, N. Klair, D. Mattia, C. Sonderman
2015: M. Nulle, D. Mellitt
2014: C. Barron, M. Nulle
2013: T. Young, M. Streeter, A. Aman, E. Kloswick, R. Tang, M. Nulle, E. Vaughn, J. Hu
2012: K. LaBelle, J. Schnieder, T. Young, M. Maguire
2011: K. LaBelle, S. Suddarth, J. Fetsch
2010: B. Pacione, M. Mooney, T. Walton, S. Ringling, B. Shrewsbury, C. Carmony, S. Chasins, C. Farris, J. Flores, P. Monroe, J. Varner, M. Kaufman, T. Young
2009: O. Holtz, S. Adeyemi, S. Zhang, M. Overholt, N. Carrion, Y. Colon, C. Norman, S. Tucker, X. Zhang
2008: B. Roesch, J. Langley, J. Hof, J. Brindza, J. Szweda
2007: M. Hudson, B. Roesch, J. Hof, P. McGowan, M. Moriarity, P. Strei, G. Allan, N. Kohlmeier, K. O'Brien
2006: N. Schott, D. Dugovic, A. Matta
2005: B. McRoskey, M. Sheehan, J. Smith, B. Jeffrey, W. Bordogna, H. Mooers, R. Pingalore, C. Hancock
2004: M. Shorts, E. Stuntebeck, C. Picardo, K. McCusker, J. Gentile, W. Leimkuhler
2003: M. Shorts, G. Shewakramani, B. Bien, E. Stuntebeck, K. McCusker

X. PROFESSIONAL ACTIVITIES – EXTERNAL SERVICE

1. **Technical Program Committee (TPC)**

IFIP Networking	2005-2008
IEEE GLOBECOM	
Wireless Symposium	2004, 2009+
Control of High Performance Networks	2006
Trusted Internet Workshop (TiW)	2004-2005
Workshop at HIPC	
IEEE AINA	2010
CNS	2021+
CNSR	2007-2009
Computer Network and Services Research	
CNSS	2007
Computer and Network Security Symposium	

AReS	2007-2011
Int'l Conference on Availability, Reliability, and Security	
ICCCN	
Internet Services, Systems, and Applications	2009
IEEE BroadNets	2007
INFOCOM External Reviewer	2008
INFOCOM Session Chair	2008
INFOCOM	2009+
INFOCOM Area Chair	2021-2024
IWCMC	2007-2008
SECRYPT	2007-2008
WiMAN (workshop at ICDCS)	2008, 2012
IEEE PIMRC	2013
Symposium on Personal, Indoor, Mobile Radio Communications	
IEEE CNS	2014, 2016
ALGOSENSORS	2014
ICNP	2014-15, 21+
ICC	
Social Networking (SN) Track	2014
PerCom WIP	2014, 2015
SEC (Symposium on Edge Computing)	2020
5G World Forum	2019+

2. **Program Chair / Volunteer Work**

Workshop on Enterprise Network Security – Co-Chair	2006
Workshop at Securecom 2006	
IEEE ICCCN	
Internet Services and Applications (Track Co-Chair)_	2008
Publicity Co-Chair	2009
Multimedia, QoS (Track Co-Chair)	2012
Workshop, General Publicity Co-Chair	2012
Workshop Co-Chair	2013, 2014
Program Chair	2015
General Chair	2016
Workshop on Cooperation in Pervasive Environments	2009
Co-Chair of workshop at Percom 2009	
IEEE BroadNets	
Internet Services and Applications (Co-Chair)	2009
IEEE INFOCOM	
Publication Co-Chair	2011, 2016
TPC Co-Chair	2025
IEEE ICNC	
Internet Services and Applications – Co-Chair	2012
Green Computing - Track Co-Chair	2018
HotPlanet	
Co-Chair w/Yanyong Zhang	2014
Workshop at IEEE MASS 2014	
Jointly held with MiSeNet	
HotPlanet	2016
Workshop at ACM Ubicomp (Heidelberg, Germany)	
IEEE MASS	
Track Chair	2016

Track Chair 2020

3. **Reviewing**

Reviewer (Journal): IEEE Trans. Networking, IEEE Network, IEEE Communications, Computer Communications, Computer Networks, IEEE Surveys/Tutorials, IEEE Trans. Computers, IEEE Trans. Parallel and Distributed Systems, Journal of High Speed Networking, Journal of Communications

Reviewing: Distinguished Reviewer - IEEE INFOCOM 2014, 2015, 2019

Area Editor / Associate Editor

2014-15 EURASIP Journal on Wireless Communications and Networking
2018+ IEEE Networking Letters
2018-2023 IEEE Transactions on Mobile Computing

4. **NATIONAL SCIENCE FOUNDATION**

Panels: CyberTrust (1), NeTS (7), CSR (1), CHS (1), CRI (1), SWIFT (1), CAREER (1)

2016 Participant - NSF Future Cities Workshop (Feb 2016)
Participant - NSF US / Japan Workshop on Trustworthy Systems (March 2016)
Participant - NSF Testbed Experiences Workshop (Nov 2016)

2004 NSF CAREER award

2001 Engineering Education Workshop (EES), August 2001.

2000 Graduate Research Fellowship – Honorable Mention

5. **INTERNET ENGINEERING TASK FORCE (IETF)**

2001-2003 DiffServ mailing list administrator (with Dr. Brian Carpenter)
2000-2010 DiffServ-Interest mailing list admin

6. **Government**

2017 Workshop on Technological Gaps and Opportunities for Realizing Open Source based end-to-end Network Architecture @ Mobicom 2017 (NSF PAWR, 5GinFire)

2016 Workshop on Future Cities @ NSF
One of 36 invited participants
Workshop on Large Scale Testbeds @ NSF
One of 30 invited participants

2015 Workshop on Fear and Social Buffering @ NSF
Invite to present on co-location work

Workshop on Accessible Remote Testbeds
Invite to present on NetSense / NetHealth efforts

2010 Cyber Security Grass Roots Effort (Multiple Agencies, led by PNNL)

2007 Dept. of Energy – Cyber Security Needs for Open Science Workshop

2006 DARPA ARO Workshop on BotNets

XI. UNIVERSITY ACTIVITIES – INTERNAL SERVICE

Departmental / College Committees

University of Notre Dame

2024+	CSE Seminar Series
2023-24	Dean Review Committee - College of Engineering
2023+	University Committee on Committees
2020	CSE Awards Committee
2020, 21	CSE Faculty Search (Chair)
2020+	BACS Program Director
2020+	BACS Implementation Committee (chair of CSE side)
2018-2021	Faculty Board of Athletics
2017-2018	Dean Review Committee – College of Engineering
2016-2019	Faculty Senate (CSE Representative)
2016	SAFE Committee (OIT committee on two-step authentication)
2015	Young Leader Notre Dame (YLND) steering committee
2015-2019, 22+	College of Engineering Elections Committee
2013-2018	University Committee on Academic Technology (UCAT)
2012-2018	Associate Chair (Dept. Comp Sci & Engr)
2012+	Wireless Institute (Executive Committee)
2008-2018	Assessment Committee (Chair)
2010+	Wireless Institute (Founding Member)
2019+	Committee on Reappointment, Promotion, and Tenure (CRPT)
2018+	Building Bridges Mentor
2010-2019	Committee on Assessment / Promotion (CAP)
2010-2018	Faculty Search
2009-2012, 2014-2017	College Council (Engineering)
2008	University Security Policy for Research (Engineering Rep)
2007-2011	College of Engineering – College Computing Committee (CCC)
2007-present	College of Engineering Security Facilitator
AY 2007	Infrastructure, Assessment (Chair)
AY 2006	Faculty Search, Assessment
AY 2005	Faculty Search, Curriculum, Facilities
AY 2004	Curriculum, Facilities
AY 2003	Graduate Student, Facilities

Notable Administrative Efforts as Associate Chair

- 2017 - Led Notre Dame ABET accreditation effort (Two programs - CS + CPEG)
- 2015 - Evaluation of offering an on-line Masters in Data Science
- 2013 - Led ND CSE ten-year self-study report creation / data collection
- 2011 - Led Notre Dame ABET accreditation effort - (Two programs - CS + CPEG)
- Mentored junior faculty

- Through three-year renewal: 5 (L. Riek, T. Milenkovic, C. McMillan, D. Wang, T. Weninger)
- Through tenure: 4 (S. D'Mello, T. Milenkovic, L. Riek, C. McMillan, T. Weninger)
- Teaching feedback

- Staff Supervision (3x admins, 1 technician, 1 study manager)

Efforts on Wireless Institute Executive Committee

- Recruitment / retention of industrial partners
  - Sprint, Alcatel-Lucent, Inter-Digital, Cisco, IBM, AT&T, Nokia, ONR, LTS
- Grant development
  - IU/CRC site, MRI submission
- NDXG steering committee for wireless on Campus Crossroads Project
  - October 2015 - Summer 2016
- Offered WiFi for University Relations tent at home football games
  - 2014-2019

Iowa State University

2001-2002 University CAC (Computer Assessment Committee) – Grad student rep
2000-2002 EE/CpE Ambassador

XII. TEACHING

Teaching - Course Experience

The overall course experience is drawn from the composite median score (CIFS, >= Fall 2008) or Q17 (TCE < 2008) which is out of a maximum score of 5.0. In the spring of 2012 and the fall of 2019, I was on sabbatical and did not have any course duties. The overall student rating is the Instructor Effectiveness (or appropriate analog). In the spring of 2013, I was on release time for being Associate Chair and had a course release of one course per year for serving in that role (Fall 2012 through Spring 2018) though occasionally served to cover necessary courses as needed during that time frame.

Course	Title/Content	Dates (Students)	Overall Effectiveness
Notre Dame CSE 40373	**Embedded System Development** Embedded system design, programming, course project	2024 Spring (22)	Not Gathered
Notre Dame CSE 20289	**Systems Programming** Required course for all CSE Shell Scripting, UNIX, Python, C	2023 Fall (26) 2024 Fall (44)	4.5 / 5.0 3.9 / 5.0
Notre Dame CSE 60896	**Advanced Wireless Networking** WiFi, Cellular, IoT	2019 Spring (5)	4.6 / 5.0
Notre Dame CSE 34468	**Internet of Things** Embedded systems, networking, Raspberry Pi, Python Dublin Summer Program (2017) Berlin Summer Program (2024)	2017 Summer (14) 2024 Summer (31)	4.3 / 5.0 Not Gathered
Notre Dame / edX EG240x	**Understanding Wireless** co-taught with Profs. Bellia, Laneman, Keating	2015 Summer (11k+ enrolled)	N/A

	MOOC focusing on principles of wireless across business, law, and engineering		
Notre Dame CSE 30341	**Operating System Principles** Required course for all CSE undergrads, threading, storage, memory management	2013 Spring (50) 2017 Spring[3] (60) 2018 Spring (48) 2021 Spring (83) 2023 Spring (43)	4.6 / 5.0 3.5 / 5.0 4.0 / 5.0 4.6 / 5.0 4.8 / 5.0
Notre Dame CSE 60641	**Graduate Operating Systems** Required course for all CSE graduate students, research aspects of operating systems	2011 Fall (25) 2012 Fall (28) 2013 Fall (27) 2014 Fall (27) 2015 Fall (36) 2021 Fall (22) 2022 Fall (36)	4.2 / 5.0 4.3 / 5.0 4.0 / 5.0 4.4 / 5.0 4.6 / 5.0 4.8 / 5.0 5.0 / 5.0
Notre Dame CSE 30264	**Computer Networks** Undergraduate computer networks	2010 Fall (23) 2011 Fall 2022 Spring (40)	4.6 / 5.0 None[5] 3.9 / 5.0
Notre Dame CSE 40416	**System Interface Design** Human / Computer Interaction	2009 Fall (22) 2010 Fall (16)	4.3 / 5.0 3.8 / 5.0
Notre Dame EG 10111	**Introduction to Engineering** Programming Module	2007 Fall (380) 2008 Fall (420)	On Request[4]
Notre Dame CSE 20211	**Fundamentals of Computing I** C/C++ Programming	2005 Fall (46) 2006 Fall (65)	3.55 / 4 3.40 / 4
Notre Dame CSE 60744	**Advanced Networking** Inter/intra-domain routing, QoS, content distribution, TCP dynamics	2007 Spring (12) 2008 Spring (2) 2020 Fall (6)	3.64 / 4 3.60 / 4 5.0 / 5.0
Notre Dame CSE 498U	**Computer Security** Security Fundamentals, Cryptography, Network Security, Database Security, Ethics	2003 Fall (22) 2004 Fall (16)	3.60 / 4 3.58 / 4
Notre Dame CSE 422 CSE 40422	**Computer System Design** VHDL, C, Embedded Programming Labs – Altera FPGA Senior Design Projects (Capstone)	2003 Spring (8) 2004 Spring (14) 2005 Spring (1) 2006 Spring (5) 2008 Spring (10) 2009 Spring (17) 2011 Spring (2)	3.5 / 4 3.69 / 4 None 3.84 / 4.0 3.92 / 4.0 None[5] None
Notre Dame CSE 40522	**Capstone Design** Capstone design project involving mixed hardware + software design	2015 Spring (10)	4.2 / 5.0
ISU Cpr E 211 (Instructor)	**Introduction to Microcontrollers** C, Assembly, Emb. Programming Labs – Motorola 68HC11	1999 Summer 2000 Spring 2001 Spring 2001 Summer	4.47 / 5 4.29 / 5 4.44 / 5 4.50 / 5

[3] CSE30341 class was simultaneously streamed to Silicon Valley as CSE34341 with 12 remote students.

[4] EG 10111 had scores broken out by section rather than a single score across all sections. The composite median was between 3.4-4.1 / 5.0.

[5] Due to a configuration mistake, CIFS were not taken for this section.

Course Development

ISU - Cpr E 211 – Introduction to Microcontrollers
Migration from 68HC11 to PowerPC 555, introduction of semester-long final projects
ND – CSE 20211 – Fundamentals of Computing I
Migration from Scheme to C/C++
ND – CSE 60744 – Advanced Networking
New graduate course offering in networking
ND – CSE 40416 – System Interface Design
New course on human / computer interface on the Nintendo Wiimote / Microsoft Surface
edX - EG240x - Understanding Wireless
MOOC on wireless from a legal, economic, and technical perspective
Modules on networking basics, WiFi basics, cellular basics
ND - CSE 34468 - Internet of Things
Summer course for the Dublin and Berlin Summer Programs involving embedded systems, networking, Raspberry Pi, Python, 3D printing / design
ND - CSE 40373 - Embedded System Development
Embedded system fundamentals including design, development, and theoretical foundations in addition to a large course project

Teaching Areas
- Computer Networking, Computer Security
- Programming – C/C++/C#/Java/Assembly
- Real-time Systems, Fault-Tolerant Systems, Multimedia Systems
- Embedded Systems
- Human Computer Interface
- Operating Systems (Undergraduate, Graduate Levels)

XIII. Industrial Experience / Collaborations

Industrial Collaborators: Sprint, Alcatel-Lucent, Google, IBM, InterDigital, AT&T, Assia

Sun Microsystems, Summer 2002
- Work on Sun Network Element (NEON), pre-cursor to Software Defined Networks / Open Flow

Motorola / Universite de Technologie – Compiegne, Spring 2002
- Edge QoS for mobile systems supporting rapid roaming with QoS considerations

Architecture Technology Corporation, Summer 2000
- Ad Hoc Routing Protocol Development – Cluster Gateway blending NAT / MobileIP for ad hoc routing support with asymmetry

Fisher Controls (now Emerson Process) – 1996, 1997, 1998 – internships
- C++ development – multiplexing for HART, LabView – support for Fieldbus, multithreading support for ValveLink software package

Expert Consultation
- Source code review, validity / invalidity analysis, infringement / non-infringement analysis, technical apportionment, secondary considerations, IPR / PTAB, class action certification including significant deposition / testifying experience (listing available upon request)

APPENDIX B

Prior Case Information - Striegel

Date: January 2025

List of Cases - Testimony or Deposition[1] - Last Five Years

Case Number / Parties	Venue / Timeline	Effort (Month Year)
2:18-cv-00094-HCM-LRL **Centripetal Networks** vs. Cisco Systems	E District of VA 2019 - 2020	Deposition (Mar 20) Testimony (May / Jun 20)
5:17-cv-04467-BLF **Finjan, Inc.** vs. Sonicwall	N District of CA 2020 - 2021	Deposition (Nov 20)
1:19-CV-00885-ADA **Freshhub** vs. Amazon, Inc.	W District of TX 2020 - 2021	Deposition (Mar 21) Testimony (Jun 21)
3:19-cv-4238-MMC-RMI Proofpoint vs. **Vade Secure**	N District of CA 2020 - 2021	Deposition (Apr 21) Testimony (Aug 21)
6:20-cv-01033-ADA Sunstone Information Defence. Inc. vs. **International Business Machines (IBM) Corporation**	W District of TX 2021 - 2022	Deposition (Feb 22) Testimony (Aug 22)
IPR2022-00096 **Hewlett Packard Enterprise Company** v. Intellectual Ventures II, LLC,	PTAB 2021 – 2022	Deposition (Aug 22)
3:21-cv-00757-JD ERICA FRASCO, individually and on behalf of all other similarly situated vs. FLO HEALTH, INC., **GOOGLE LLC**, META PLATFORMS, INC., and FLURRY LLC	N District of CA 2023+	Deposition (Aug 23)
5:21-cv-02155 BENJAMIN HEWITT and KIMBERLY WOODRUFF, on behalf of themselves and all others similarly situated vs. **GOOGLE LLC**	N District of CA 2023+	Deposition (Oct 23)
IPR2023-01251 DEXCOM, INC. vs. **ABBOTT DIABETES CARE INC.**	PTAB 2024+	Deposition (Jul 24)
4:23-cv-002698-YGR **InfoExpress Inc**. vs. Cisco Systems, Inc. 4:23-cv-004389-YGR **InfoExpress Inc.** vs. Fortinet, Inc.	N District of CA 2023+	Deposition (Aug 24)

[1] Hiring party denoted in bold (e.g. Centripetal)

List of All Companies - Employment

University of Notre Dame – Notre Dame, IN

- Professor, Department of Computer Science and Engineering

List of All Parties – Consulting – Last Five Years

Cases that are still on-going are demarcated with a plus (+) following the starting date. Hiring party is denoted in bold.

Case Number / Parties / Subject	**Venue / Timeline**	**Effort (Date)**
2:18-cv-00094-HCM-LRL **Centripetal Networks** vs. Cisco Systems Network Security	E District of VA 2019 – 2020	Reports Deposition (Mar 20) Testimony (May / Jun 20)
5:17-cv-04467-BLF **Finjan, Inc.** vs. Sonicwall Network Security, Computer Security	N District of CA 2020 – 2021	Report Deposition (Nov 20)
1:19-CV-00885-ADA **Freshhub** vs. Amazon, Inc. Voice Shopping / Distributed Systems	W District of TX 2020 – 2021	Reports Deposition (Mar 21) Testimony (Jun 21)
3:19-cv-4238-MMC-RMI Proofpoint vs. **Vade Secure** E-Mail Security	N District of CA 2020 – 2021	Source Code Analysis Reports Deposition (Apr 21) Testimony (Aug 21)
3:18-cv-01251-M **CUPP Cybersecurity LLC** et al v. Trend Micro Inc et al Computer Security	N District of TX 2021	Source Code Analysis
IPR2022-00096 **Hewlett Packard Enterprise Company** v. Intellectual Ventures II, LLC,	PTAB 2021 – 2022	Declaration, Report, Deposition (Aug 22)
6:20-cv-01033-ADA Sunstone Information Defence. Inc. vs. **International Business Machines (IBM) Corporation**	W District of TX 2021 – 2022	Reports, Deposition (Feb 22), Testimony (Aug 22)
6:20-cv-00487-ADA **WSOU INVESTMENTS, LLC D/B/A BRAZOS LICENSING AND DEVELOPMENT** vs. ZTE CORPORATION ET AL	W District of TX 2022	Affidavit (Nov 22)
1:21-cv-00977-KAJ	Delaware 2022	Disclosed

ABBOTT DIABETES CARE INC. and ABBOTT DIABETES CARE LIMITED vs. DEXCOM, INC.		
9:22-cv-80388-DMM OLLNOVA TECHNOLOGIES, LTD. vs. **CARRIER GLOBAL CORPORATION**	S District of FL 2022 - 2023	Affidavit (Nov 22) Source Code Analysis
50-2022-CA-005163-XXXX- MB YUZZ BUZZ, LLC, vs. **SPRINGBIG, INC.**	S District of FL 2023	Source Code Analysis Report (Jun 23)
3:21-cv-00757-JD ERICA FRASCO, individually and on behalf of all other similarly situated vs. FLO HEALTH, INC., **GOOGLE LLC**, META PLATFORMS, INC., and FLURRY LLC	N District of CA 2023	Report (Jun 23) Deposition (Aug 23)
5:21-cv-02155 BENJAMIN HEWITT and KIMBERLY WOODRUFF, on behalf of themselves and all others similarly situated vs. **GOOGLE LLC**	N District of CA 2023+	Report (Sep 23) Deposition (Oct 23) Report (Jan 25)
4:20-cv-01525-YGR MARK MAHON vs. **YOUTUBE LLC**	N District of CA 2023	Report (July 23)
4:20-cv-01534-YGR MARK MAHON vs. **APPLE INC.**	N District of CA 2023	Report (July 23)
IPR2023-01251 DEXCOM, INC. vs. **ABBOTT DIABETES CARE INC.**	PTAB 2024	Report (May 24) Deposition (Jul 24)
1:17-cv-01812-RTH **GIESECKE+DEVRIENT GMBH** vs. THE UNITED STATES	US Court of Federal Claims 2024+	Disclosed
4:23-cv-002698-YGR **InfoExpress Inc**. vs. Cisco Systems, Inc. 4:23-cv-004389-YGR **InfoExpress Inc.** vs. Fortinet, Inc.	N District of CA 2023+	Report (Jun 24) Deposition (Aug 24)
IPR2024-00521 DEXCOM, INC. vs. **ABBOTT DIABETES CARE INC.**	PTAB 2024	Report (Dec 24)
IPR2024-00539 Cisco Systems, Inc., Fortinet, Inc. vs. **InfoExpress Inc.**	PTAB 2024+	Report (Jan 25)

Other Commitments

All commitments listed below are not publicly disclosed but details may be provided as appropriate with respect to any conflict of interest issues.

Area	Role
Network Security	Technical consulting – litigation preparation
Secure Verification	Technical consulting – litigation preparation
Geolocation / web services	Technical consulting - litigation preparation

Identification - Pending Works / IP

- Two intellectual property disclosures related to WiFi network characterization (network speed) with Notre Dame Office of Research
- Intellectual property disclosure on low-cost spectrum scanning
- Intellectual property disclosure on blockchains and secure contract tracing
- Disclosure (with AT&T) regarding cellular network characterization, short video service characterization

All provisional patents and patents are disclosed in my CV.

Additional Funding

All grant funds from government agencies, industrial partners, and foundations are identified in my CV.