Michael Rabinovich

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Research Interests

My current interests revolve around distributed systems and networking. In particular, my current focus is on Internet measurements, Internet security, content delivery networks, and cloud computing.

Education

PhD in Computer Science	University of Washington (Seattle), 1994.
MS in Computer Science	University of Washington (Seattle), 1991.
Dipl. in Comp. Eng. (equiv. to MS)	Leningrad Electrotechnical Institute (Russia), 1979, With Distinction.
Dipl. in Piano Ed. and Accompaniment	College of Music of Leningrad State Conservatory, 1976.

Appointments

- 2022 – present. Dept. of Computer and Data Sciences. Case Western Reserve University. Professor Emeritus/Research Professor.
- 2005 – 2021. EECS Dept., Dept. of Computer and Data Sciences. Case Western Reserve University. Professor.
- 1994 – 2005. AT&T Bell Labs; AT&T Labs – Research. Tech. Staff Mem.; Sr. Tech. Staff Mem.; Principal Tech. Staff Mem.; Technology Consultant.
- 9/89 - 94. University of Washington, Seattle.
  Graduate student, Research Assistant.
  - Summer 1993. Matsushita Information Technology Lab, Princeton, NJ.
    Summer Intern.
  - Summer 1990. DEC Systems Research Center, Palo Alto, CA.
    Research Intern.
- 1979-1989. A software engineer, various firms in Russia and the US.

Publications (Refereed and Invited)

- **Book and Book Chapters:**

  [93] M. Rabinovich and O. Spatscheck. *Web Caching and Replication*, 370pp. Addison Wesley, December 2001.

  [92] H. A. Alzoubi, M. Rabinovich, S. Lee, J. Van Der Merwe, and O. Spatscheck. Anycast Request Routing for Content Delivery Networks. An invited chapter in M. Pathan and R. Sitaraman (Eds.). "Advanced Content Delivery, Streaming, and Cloud". Wiley Publishers, 2014.

  [91] B. Bhattacharjee and M. Rabinovich. Overlay Networking and Resiliency. An invited chapter in C. Kalmanek and R. Yang (Eds.). Guide to Reliable Internet Services and Applications." pp. 221-254, Springer, March 2010.

  [90] C. Canali, M. Rabinovich, and Z. Xiao. Utility computing for Internet applications. An invited chapter in Xueyan Tang et al. (Eds.). "Web Content Delivery". pp. 131-152, Springer, 2005.

- **Web and Internet:**

  [89] J. Mao, M. Rabinovich, and K. Schomp. Assessing Support for DNS-over-TCP in the Wild. *Passive and Active Measurement Conf.*, 2022.

  [88] Y. Huang, M. Rabinovich, and R. Al-Dalky. FlashRoute: Efficient Traceroute on a Massive Scale. *ACM SIGCOMM Internet Measurement Conf.*, 2020.

  [87] Z. Al-Qudah, Ibrahim Jomhawy, Mohammad Alsarayreh, Michael Rabinovich, On the stability and diversity of Internet routes in the MPLS era, *Performance Evaluation*, Volume 138, April 2020. (A revised and extended version of [81]).

  [86] R. Al-Dalky, M. Rabinovich, and K. Schomp. A Look at the ECS Behavior of DNS Resolvers. *ACM SIGCOMM Internet Measurement Conf.*, 2019.

  [85] M. Rabinovich, M. Allman, S. Brennan, B. Pollack, and J. Xu. Rethinking Home Networks in the Ultrabroadband Era. *IEEE Int. Conf. on Distributed Computing Systems*, Invited paper (lightly reviewed), 2019.

  [84] S. Brennan and M. Rabinovich. Improving Communication Through Overlay Detours: Pipe Dream or Actionable Insight? *IEEE Int. Conf. on Distributed Computing Systems (ICDCS)*, pp. 1422-1431, Invited paper (lightly reviewed) 2018.

  [83] R. Al-Dalky, M. Rabinovich, and M. Allman. Practical Challenge-Response for DNS. *ACM SIGCOMM Computer Communication Review*, 48.3, pp. 20-28, 2018.

  [82] J. Xu and M. Rabinovich. NoCDN: Scalable Content Delivery Without a Middleman. *5th IEEE Workshop on Hot Topics in Web Systems and Technologies (HotWeb)*, Invited paper, 2017.

  [81] Z. Al-Qudah, M. Alsarayreh, I. Jomhawy, and M. Rabinovich. Internet Path Stability: Exploring the Impact of MPLS Deployment. *IEEE Globecom*, 2016.

  [80] S. Triukose and M. Rabinovich. Client-Centric Content Delivery Network. *4th IEEE Workshop on Hot Topics in Web Systems and Technologies (HotWeb)*, 2016.

  [79] K. Schomp, M. Rabinovich, and M. Allman. Towards a Model of DNS Client Behavior. *Passive and Active Measurement Conf.*, 2016.

  [78] Z. Al-Qudah, E. Johnson, M. Rabinovich, and O. Spatscheck. Internet With Transient Destination-Controlled Addressing. *IEEE/ACM Trans. on Networks*, 24(2), pp. 731-744, 2016.

[77] H. Ding and M. Rabinovich. TCP Stretch Acknowledgements and Timestamps: Findings and Implications for Passive RTT Measurement. *ACM SIGCOMM Computer Communication Review*, 45(3), pp. 20-27, 2015.

[76] H. Qian and M. Rabinovich Mega Data Center for Elastic Internet Applications. *The 11th High-Perf. Grid and Cloud Computing Workshop*, 2014.

[75] K. Schomp, T. Callahan, M. Rabinovich, and M. Allman. Assessing DNS Vulnerability to Record Injection. *The 15th Passive and Active Measurement Conf.,* pp. 214–223, 2014.

[74] T. Ouyang, S. Ray, M. Allman, and M. Rabinovich. A Large-Scale Empirical Analysis of Email Spam Detection Through Network Characteristics in a Stand-Alone Enterprise. *Computer Networks,* #59, pp. 101–121; February 2014.

[73] K. Schomp, T. Callahan, M. Rabinovich and M. Allman. On Measuring the Client-Side DNS Infrastructure. *ACM SIGCOMM Internet Measurement Conf.,* pp. 77–90, 2013.

[72] T. Callahan, M. Allman, and M. Rabinovich. On Modern DNS Behavior and Properties. *Computer Communication Review,* 43(3), pp. 7-15, 2013.

[71] H. Qian and M. Rabinovich. Application Placement and Demand Distribution in a Global Elastic Cloud: A Unified Approach *10th USENIX Int. Conf. on Autonomic Computing,* pp. 1–12, 2013.

[70] H. A. Alzoubi, M. Rabinovich, and O. Spatscheck. The Anatomy of LDNS Clusters: Findings and Implications for Web Content Delivery. *22d Int. WWW Conf.,* pp. 83–94, 2013.

[69] H. A. Alzoubi, M. Rabinovich, and O. Spatscheck. Performance Implications of Unilateral Enabling of IPv6. *The 14th Passive and Active Measurement Conf.,* pp. 115–124, 2013.

[68] T. Callahan, M. Allman, and M. Rabinovich. Pssst, Over Here: Communicating Without Fixed Infrastructure. *IEEE Infocom Miniconf.,* pp. 2841–2845, 2012.

[67] H. Qian, M. Rabinovich, and Z. Al-Qudah. Bringing Local DNS Servers Close to Their Clients. *IEEE Globecom,* pp. 1–6, December 2011.

[66] H. Alzoubi, S. Lee, M. Rabnovich, O. Spatscheck, and J. Van der Merve. A Practical Architecture for an Anycast CDN. *ACM Trans. on the Web.,* 5(4), pp. 1–29, 2011 (a revised and extended version of [49]).

[65] Z. Wen and M. Rabinovich. Dynamic Landmark Triangles: A Simple and Efficient Mechanism for Inter-Host Latency Estimation. *Computer Networks,* 55(8), pp. 1864-1879, 2011 (an abstract previously appeared in [51]).

[64] Tom Callahan, Mark Allman, Michael Rabinovich, and Owen Bell. On grappling with meta-information in the internet. *Computer Communication Review,* 41(5), pp. 13-23, 2011.

[63] S. Triukose, Z. Wen, and M. Rabinovich. Measuring a Commercial Content Delivery Network. *The 20th Int. World Wide Web Conf.,* pp. 467–476, 2011 (an abstract of some aspects of this work previously appeared in [55]).

[62] T. Ouyang, S. Ray, M. Rabinovich, and M. Allman. Can Network Characteristics Detect Spam Effectively in a Stand-Alone Enterprise? *The 12th Passive and Active Measurements Conf.,* pp. 92–101, 2011.

[61] Z. Al-Qudah, M. Rabinovich, and M. Allman. Web Timeouts and Their Implications. *The 11th Passive and Active Measurements Conf.,* pp. 211–221, 2010.

[60] M. Rabinovich and O. Spatscheck. Evasive Internet: Reducing Internet Vulnerability Through Transient Addressing. *The 13th IEEE Global Internet Symp.,* pp. 1–6, 2010.

[59] W. Zhang, H. Qian, C. Wills, and M. Rabinovich. Agile Resource Management in a Virtualized Data Center. *The 1st Joint WOSP/SIPEW Int. Conf. on Performance Engineering,* pp. 129–140, 2010.

[58] S. Triukose, Z. Al-Qudah, and M. Rabinovich. Content Delivery Networks: Protection or Threat? *14th European Symp. on Research in Computer Security,* pp. 371–389, 2009.

[57] Z. Al-Qudah, H. Alzoubi, M. Allman, M. Rabinovich, and V. Liberatore. Efficient Application Placement in a Dynamic Hosting Platform. *The 18th Int. World Wide Web Conf.,* pp. 281–290, 2009.

[56] Z. Al-Qudah, S. Lee, M. Rabinovich, O. Spatscheck, and J. Van der Merwe. Anycast-Aware Transport for Content Delivery Networks. *The 18th Int. World Wide Web Conf.,* 2009.

[55] S. Triukose, Z. Wen, and M. Rabinovich. Content Delivery Networks: How Big is Big Enough? (Poster paper) *ACM SIGMETRICS,* 2009.

[54] T. W. Cho, M.Rabinovich, K. K. Ramakrishnan, D. Srivastava and Y. Zhang, Enabling Content Dissemination Using Efficient and Scalable Multicast. *The 28th IEEE International Conference on Computer Communications (Infocom 2009),* 2009.

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[52] Y.-F. Chen, Y. Huang, R. Jana, H. Jiang, M. Rabinovich, J. Rahe, B. Wei, and Z. Xiao. Towards Capacity and Profit Optimization of Video-on-Demand Services in a Peer-Assisted IPTV Platform. (Significantly extended and modified version of the NOSSDAV'2007 paper below). *Multimedia Systems,* Volume 15, Issue 1, pp. 19–32, 2009.

[51] Z. Wen and M. Rabinovich. Network Distance Estimation With Dynamic Landmark Triangles. (Poster paper) *ACM SIGMETRICS,* June 2008.

[50] M. Allman, L. Martin, M. Rabinovich, and K. Atchinson. On Community-Oriented Internet Measurement. *The 9th Passive and Active Measurements Conf.,* April 2008.

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[48] T. Ouyang and M. Rabinovich. Weeding Spammers at the Root: A Precise Approach to Spam Reduction. *The 11th IEEE Global Internet Symp.,* April 2008.

[47] Z. Wen, S. Triukose, and M. Rabinovich. Facilitating Focused Internet Measurements. *ACM SIGMETRICS*, June 2007.

[46] H. Alzoubi, M. Rabinovich, and O. Spatcheck. MyXDNS: A Request Routing DNS Server With Decoupled Server Selection. *The 16th Int. World Wide Web Conf*, May 2007.

[45] H. Qian, E. Miller, W. Zhang, M. Rabinovich, and C. Wills. Agility in Virtualized Utility Computing. *2d Int. Workshop on Virtualization Technology in Distributed Computing*, November 2007.

[44] Y.-F. Chen, Y. Huang, R. Jana, H. Jiang, M. Rabinovich, B. Wei, and Z. Xiao. When is P2P Technology Beneficial for IPTV Services? *The 17th ACM Int. Workshop on Network and Operating Systems Support for Digital Audio & Video (NOSSDAV)*, June 2007 **Best paper award**.

[43] Y. Huang, Y.-F. Chen, R. Jana, H. Jiang, M. Rabinovich, A. Reibman, B. Wei, and Z. Xiao. Capacity Analysis of MediaGrid: a P2P IPTV Platform for Fiber to the Node (FTTN)

Networks. *IEEE Journal on Selected Areas in Communications*, Vol. 25, No. 1, January 2007.

[42] M. Rabinovich, S. Triukose, Z. Wen, and L. Wang. DipZoom: The Internet Measurements Marketplace. *The 9th IEEE Global Internet Symp.*, May 2006.

[41] L. Bent, M. Rabinovich, G. Voelker, and Z. Xiao. Towards Informed Web Content Delivery. *The 9th Int. Web Caching and Content Delivery Workshop (WCW'04)*, pp. 232–248, September 2004.

[40] L. Bent, M. Rabinovich, G. Voelker, and Z. Xiao. Characterization of a Large Web Site Population with Implications for Content Delivery. *World Wide Web*, Vol 9, No 4, pp. 505-536, December, 2006. Preliminary version appeared at *The 13th Int. World Wide Web Conf.,*, pp. 522–533, May 2004 (where it received **Best student paper award.**).

[39] M. Rabinovich and Z. Xiao. Computing on the Edge: A Platform for Replicating Internet Applications. *The 8th Int. Web Caching and Content Delivery Workshop (WCW'03)*, pp. 57–77, September 2003.

[38] B. Krishnamurthy, R. Liston, and M. Rabinovich. DEW: DNS-Enhanced Web for Faster Content Delivery. *The 12th Int. World Wide Web Conf.,* pp. 310–320, May 2003.

[37] M. Rabinovich, Z. Xiao, F. Douglis, and C. Kalmanek. Moving Edge-Side Includes to the Real Edge - the Clients. *USENIX Symposium on Internet Technologies and Systems.,* pp. 155–168, March 2003.

[36] Y. Jung, B. Krishnamurthy, and M. Rabinovich. Flash Crowds and Denial of Service Attacks: Characterization and Implications for CDNs and Web Sites. *The 11th Int. World Wide Web Conf.,* pp. 293–304, May 2002.

[35] Z. M. Mao, C. Cranor, F. Douglis, M Rabinovich, O. Spatscheck, and J. Wang. A precise and efficient evaluation of the proximity between Web clients and their local DNS servers. *USENIX Annual Technical Conference,* pp. 229–242, 2002.

[34] P. Karbhari, M. Rabinovich, Z. Xiao, and F. Douglis. ACDN: a content delivery network for applications. *A demo track at ACM SIGMOD Conf. on Management of Data,* p. 619, June 2002.

[33] M. Rabinovich and H. Wang. DHTTP: An Efficient and Cache-Friendly Transfer Protocol for Web Traffic. *IEEE INFOCOM Conference,* pp. 1597-1606, 2001. Expanded version appeared in *IEEE/ACM Trans. on Networking*, 12(6), pp. 1007-1020, 2004.

[32] F. Douglis, S. Jain, J. Klensin, and M. Rabinovich. Click-once Hypertext: Now You See It, Now You Don't. *2nd IEEE Workshop on Internet Applications (WIAPP'01)*, pp. 84–93, July 2001.

[31] A. Biliris, C. Cranor, F. Douglis, M. Rabinovich, S. Sibal, O. Spatscheck, and W. Sturm. CDN Brokering. *6th Int. Web Caching and Content Delivery Workshop (WCW'01)*, June 2001. Also appeared in *Computer Communications*, Vol. 25(4), pp. 393-402, March 2002.

[30] S. Gadde, J. Chase, and M. Rabinovich. Web Caching and Content Distribution: A View From the Interior. *5th Int. Web Caching and Content Delivery Workshop (WCW'00)*, May 2000. Also appeared in *Computer Communications*, Vol. 24(2), pp. 222–231, February 2001.

[29] M. Rabinovich and A. Aggarwal RaDaR: A scalable architecture for a global Web hosting service. The 8th Int. World Wide Web Conf., pp. 1545–1561, May 1999.

[28] M. Rabinovich, I. Rabinovich, R. Rajaraman, and A. Aggarwal. A dynamic object replication and migration protocol for an Internet hosting service. *IEEE Int. Conf. on Distributed Computing Systems,* pp. 101–113, May 1999.

[27] A. Feldmann, R. Caceres, F. Douglis, G. Glass, and M. Rabinovich. Performance of Web Proxy Caching in Heterogeneous Bandwidth Environments. *IEEE INFOCOM Conference,* pp. 107–116, 1999.

[26] R. Caceres, F. Douglis, A. Feldmann, G. Glass, and M. Rabinovich. Web Proxy Caching: The Devil is in the Details. *1st Workshop on Internet Server Performance.* June 1998.

[25] M. Rabinovich. Issues in Web Content Replication. *Data Engineering Bulletin.* Invited paper, Vol. 21 No. 4. pp. 21–29, December 1998.

[24] S. Gadde, J. Chase, and M. Rabinovich. A Taste of Crispy Squid. *1st Workshop on Internet Server Performance.* June 1998.

[23] M. Rabinovich, J. Chase, and S. Gadde. Not All Hits Are Created Equal: Cooperative Proxy Caching Over a Wide-Area Network. *3rd International WWW Caching Workshop (WCW'98).* June 1998. Also appeared in *Computer Networks and ISDN Systems,* Vol. 30, pp. 2253–2259, November 1998.

[22] F. Douglis, A. Haro, and M. Rabinovich. HPP: HTML Macro-Preprocessing to Support Dynamic Document Caching. *USENIX Symposium on Internet Technologies and Systems.* pp. 83-94, December 1997.

[21] S. Gadde, M. Rabinovich, and J. Chase. Reduce, Reuse, Recycle: An Approach to Building Large Internet Caches. *6th Workshop on Hot Topics in Operating Systems (HotOS'97)*, pp. 93–98, May 1997.

[20] G. Banga, F. Douglis, and M. Rabinovich. Optimistic deltas for WWW latency reduction. *USENIX Annual Technical Conference*, pp. 83–94, 1997

- **Web Data Management:**

[19] W. Fenner, M. Rabinovich, K. K. Ramakrishnan, D. Srivastava, and Y. Zhang. XTreeNet: Scalable Overlay Networks for XML Content Dissemination and Querying (Synopsis). *10th Int. Workshop on Web Content Caching and Distribution*, September 2005.

[18] N. Koudas, M. Rabinovich, D. Srivastava, and T. Yu. Routing XML Queries (a poster). *20th IEEE Int. Conf. on Data Engineering*, p. 844, April 2004.

- **Workflow management:**

[17] J. Eder, E. Panagos, and M. Rabinovich. Time constraints in workflow systems. *The 11th Conference on Advanced Information Systems Engineering (CAiSE'99)*, pp. 286–300, June 1999.

[16] J. Eder, E. Panagos, H. Pezewaunig, and M. Rabinovich. Time management in workflow systems. *3d Int. Conf. on Business Information Systems*, pp. 265–280, Invited paper. April 1999.

[15] E. Panagos and M. Rabinovich. Reducing Escalation-Related Costs in WFMSs. *NATO Summer School*, 107–127, Invited paper. Springer-Verlag, 1998.

[14] E. Panagos and M. Rabinovich. Predictive Workflow Management. *The 3d Workshop on the Next Generation Information Technology and Systems (NGITS'97)*, pp. 193–197, 1997.

[13] E. Panagos and M. Rabinovich. Escalations in workflow management systems. *DART'96 Workshop (Databases: Active and Real Time)*, pp. 25–28, 1996.

- **Distributed Transactions**

[12] H. V. Jagadish, I. S. Mumick, and M. Rabinovich. Asynchronous Version Advancement in a Distributed Three-version Database. *14th IEEE Int. Conf. on Data Engineering,* pp. 424–435, February 1998.

[11] H. V. Jagadish, I. S. Mumick, and M. Rabinovich. Scalable Versioning in Distributed Databases with Commuting Updates. *13th IEEE Int. Conf. on Data Engineering,* pp. 520–531, 1997.

[10] M. Rabinovich, N. Gehani, and A. Kononov. Efficient update propagation in epidemic replicated databases. *5th Int. Conf. on Extending Database technology,* pp.207–222, 1996.

[9] M. Rabinovich and E. D. Lazowska. Efficient support for partial write operations in replicated databases. *10th IEEE Int. Conf. on Data Engineering,* pp. 43–53, February 1994.

[8] M. Rabinovich and E. D. Lazowska. Asynchronous epoch management in replicated databases. *Proc. 7th Int. Workshop on Distributed Algorithms,* pp. 115–128, Springer-Verlag, September 1993.

[7] A. Kumar, M. Rabinovich, and R. Sinha. A performance study of general grid structures for replicated data. *13th IEEE Int. Conf. on Distributed Computing Systems*, pp. 178–185, May 1993.

[6] M. Rabinovich and E. D. Lazowska. An efficient and highly available read-one write-all protocol for replicated data management. *2d IEEE Int. Conf. on Parallel and Distributed Information Systems*, pp. 56–65, January 1993.

[5] M. Rabinovich and E. D. Lazowska. Improving fault-tolerance and supporting partial writes in structured coterie protocols for replicated objects. *ACM SIGMOD Conf. on Management of Data*, pp. 226–235, June 1992.

[4] M. Rabinovich and E. D. Lazowska. A fault-tolerant commit protocol for replicated databases. *11th ACM Symp. on Principles of Database Systems*, pp. 139–148, June 1992.

[3] M. Rabinovich and E. D. Lazowska. The dynamic tree protocol: avoiding "graceful degradation" in the tree protocol for distributed mutual exclusion. *11th IEEE Int'l Phoenix Conf. on Computers and Communications*, pp. 101–109, April 1992.

- **Other:**

[2] M. Rabinovich. Algorithms for document header transformation. (In Russian.) All-Union Institute for Scientific and Technical Information. Paper No. 8014-B88. 1988, Moscow, USSR.
Abstract also appeared in *Upravliaushchie sistemy i mashiny (Control Systems and Machines, Journal of the Academy of Science of Ukraine)*, No. 1, 1989, p. 64. Kiev, USSR.

[1] M. Rabinovich. Automatization of programming in document printing. (In Russian.) *Upravliaushchie sistemy i mashiny (Control Systems and machines, Journal of the Academy of Science of Ukraine)*, No. 1, 1986, pp. 107–110. Kiev, USSR.

Patents

Internet measurement system application programming interface. Patent #9,021,082 (April 28, 2015)

Methods and systems to store state used to forward multicast traffic (with K. K. Ramakrishnan, D. Srivastava, T. W. Cho, Y. Zhang). Patent # 8,295,203 (October 23, 2012)

Multicast with adaptive dual-state (with K. K. Ramakrishnan, D. Srivastava, T. W. Cho, Y. Zhang). Patent # 8,064,446 (November 22, 2011)

Monitoring for replica placement and request distribution (with C. Canali, A. Gerber, S. Fisher, O. Spatscheck, and Z. Xiao). Patent # 7,941,556 (May 10, 2011)

System and method for peer to peer video streaming (with Y. Huang, Y-F Chen, R. Jana, A. Reibman, B. Wei, and Z. Xiao). Patent # 7,903,652 (March 8, 2011)

Method and apparatus for limiting reuse of domain name system response information (with F. Douglis and O. Spatscheck). Patents #7,725,536 (May 25, 2010) and 7,444,371 (October 28, 2008)

Routing XML queries (with N. Koudas and D. Srivastava). Patent #7,664,806, February 16, 2010 and 8,001,146 (August 16, 2011)

Method and systems for content access and distribution (with K. Ramakrishnan, W. Fenner, D. Shrivastava, and Y. Zhang). Patent #7,623,534, November 24, 2009

Method and apparatus for content distribution network brokering and peering (with A. Biliris, C. Cranor, F. Douglis, C. Nelson, S. Sibal, O. Spatscheck, and W. Sturm). patent #7,562,153, July 14, 2009

Eliding Web Page Content (with F. Douglis, S. Jain, and J. Klensin). Patent #7,216,297; May 8, 2007

Method for content distribution in a network supporting a security protocol (with F. Douglis, A. Rubin, and O. Spatscheck). patent #7,149,803; December 12, 2006

Cache invalidation technique with spurious resource change indications (with B. Krishnamurthy). Patent #6,912,562; June 28, 2005

Method for transferring and displaying data pages on a data network (with G. Banga, F. Douglis, H. V. Jagadish, K.-Ph. Vo). Patent #6,910,073; June 21, 2005

Methods for dynamically predicting workflow completion times and workflow escalations (with E. Panagos). Patent #6,601,035; July 29, 2003

Method and apparatrus for asynchronous version advancement in a three version database (with H. V. Jagadish and I.S. Mumick). Patent #6,351,753; February 26, 2002

System and Method for allocating requests for objects and managing replicas of objects on a network. Patents #6,256,675 (July 3, 2001) and 6,484,204 (November 19, 2002)

Replication service system and method for directing the replication of information servers based on selected plurality of servers load (with I. Rabinovich). Patent #6,167,427; December 26, 2000.

Computer System Having A Plurality Of Resources And Utilizing A Selection Mechanism To Select The Resources Based Upon Historical Loading. Patent #6125394; September 26, 2000.

Method for reducing perceived delay between a time data is requested and a time data is available for display (with G. Banga, F. Douglis, and H. V. Jagadish) Patents #6,240,447 (May 29, 2001) and #5,931,904 (September 3, 1999).

Method and Apparatus for Dynamic Data Transfer (with A. Haro and F. Douglis). Patent #6021426; February 01, 2000.

Maintaining consistency of database replicas (with N. Gehani and A. Kononov); Patents #6,098,078 (August 1, 2000) and #5,765,171 (June 9, 1998).

Network with shared caching (with J. Chase and S. Gadde). Patent #5,944,780; August 31, 1999.

Preventing conflicts in distributed systems (with N. Gehani and A. Kononov). #5,802,062; September 1, 1998.

External Funding (REU Supplements Omitted)

- M. Rabinovich (PI). Effective Geolocation of Internet Hosts. NSF Award number 2219736. 10/01/2022 - 09/30/2025. $599,185.
- M. Rabinovich (PI for Case, lead institution) and M. Allman (PI for ICSI). Rethinking Home Networking for the Ultrabroadband Era. NSF Grant CNS-1647145. 01/01/2017-12/31/2021. $638,145 (Case portion; award total for both PIs is $938,145).
- M. Allman (PI for ICSI, lead institution), N. Weaver (Co-PI for ICSI), M. Rabinovich (PI for Case). Collaborative Research: Relationship-Oriented Networking. NSF Grant CNS-0831821. 01/01/2009-12/31/2014. $449,236 (Case portion; award total is $899,969).
- M. Rabinovich (PI). Understanding the Roots of the Spam Problem – Email Address Trafficking. NSF Grant CNS-0916407. 08/01/2009-07/31/2011. $146,252.
- M. Rabinovich (PI). Dipzoom: A Global Ecosystem for Internet Measurements. NSF Grant CNS-0721890. 08/2007-07/2010. $400,000.
- M. Rabinovich (PI for Case, lead institution) and C. Wills (PI for WPI). Virtual Machines Meet Application Clusters: A Highly Responsive Global Utility Computing Platform for Internet Applications. NSF Grant CNS-0615190. 08/2006-07/2009. $256,524 (Case portion; award total for both PIs is $494,904).
- M. Rabinovich (PI) and L. Wang (co-PI). The Internet Measurements Marketplace. NSF Grant CNS-0551605. 08/2005-07/2007. $200,000.
- J. Yang (PI), J. Li (co-PI), G. Ozoyoglu (co-PI), Z. M. Ozsoyoglu (co-PI), M. Rabinovich (co-PI), M. C. Cavusoglu, S. Jin, V. Liberatore, K. Loparo. CRI: Infrastructure for Managing and Analyzing Large Scale Biological Data via Utility Computing. NSF Grant CNS-0551603. 09/2006-09/2009. $313,053.
- S. Jin (co-PI), V. Liberatore (co-PI), and M. Rabinovich (PI). Efficient Routing in Mobile Wireless Networks. A grant from Lockheed Martin Corp. 07/2006 - 12/2006. $40,000.
- S. Jin (PI), V. Liberatore (co-PI), and M. Rabinovich (co-PI). Routing Protocols and Service Enhancements for Disadvantaged Users in Mobile Ad Hoc Environments A grant from Lockheed Martin Corp. 01/2007 - 12/2007. $100,000 (Award total; Rabinovich's share is 28%).
- M. Rabinovich (PI). An unrestricted gift to support networking research. AT&T. 11/2008. $35,000.

Graduate Student Mentoring

- PhD Graduates:
  - Zhihua Wen (2009). Dissertation: "Symplifying End-to-End Measurement on the Internet". First employment: Microsoft.

- Zakaria Al-Qudah (2009). Dissertation: "Efficiency and Security Issues in Global Hosting Platforms". First employment: Yarmouk University (Jordan).
- Hangwei Qian (2012). Dissertation: "Dynamic Resource Management of Cloud-Hosted Internet Applications". First employment: VMWare.
- Tom Callahan (2013). Dissertation: "Understanding Internet Naming: From the Modern DNS Echosystem to New Directions in Naming." First Employment: Explorys.
- Sipat Triukose (2013). Dissertation: "A Scalable Platform for Global Internet Measurements and Its Applications in Content Delivery Networks". First employment: National ICT Australia.
- Hussein Alzoubi (2014). Dissertation: "Request Routing in Content Delivery Networks". First employment: Bloomberg Financial Services.
- Kyle Schomp (2016). Dissertation: "Complexity and Security of the Domain Name System". First employment: Akamai.
- Rami Al-Dalky (2019). Dissertation: "Issues in Security and Performance of the DNS Echosystem". First employment: Microsoft.
- Tu Ouyang. (2022). Dissertation: "On Mitigating Email Spam and Phishing URLs". First employment: Twitter.

- MS Graduates: Abhijit Jejurkar (MS'2007 → Medtronics), Michael Jolson (MS'2007 → Microsoft), Eamon Johnson (MS'2011 → Case PhD student), Maaz Khan (MS'2011 → Bloomberg), Song Zhao (MS'2013 → Cisco), Fajar Sudrajat (MS'2017 → Bank Rakyat Indonesia – the firm that funded his MS study), Stephen Brennan (MS'2017 → Yelp), Junbo Xu (MS'2017 → AMD), Yaokai Young (MS2018 → Amazon), Brian Pollack (MS'2019 → Amazon). Yinhang Cheng (MS'2019 → Alibaba).
- Current Students:

  Yuchen Huang (PhD), Jerome Mao (PhD), Tu Ouyang (PhD), Nick Kernan (MS).

Awards

- Research Excellence Award. AT&T Labs - Research, November 2002.
- Research Excellence Award. EECS Department, CWRU. 2006.
- Best Paper Award. NOSSDAV'2007.
- Best Student Paper Award (on the account of Leeann Bent, a student co-author). WWW'2004.
- CaiSE'1999 paper selected to collection "Seminal Contributions to Information Systems Engineering: 25 Years of CAiSE".

Professional Service

- Editorial and Advisory Boards:
  - Editor-in-Chief for IEEE Internet Computing (2010–2014).
  - Senior Associate Editor for ACM Trans. on the Web (2005 – present).

- Member of the Executive Committee of the IEEE Technical Committee on the Internet (2012 – 2016).

- Program Committee (PC) Leadership:
  - PC Co-Chair for WWW'2012
  - Track Co-Chair for WWW'2023 (Systems and Infrastructure for Web, Mobile Web, and Web of Things)
  - Track Co-Chair for WWW'2019 (Intelligent Systems and Infrastructure Track)
  - Area Chair for ICNP'2012 (Web/Security Area)
  - Area Co-Chair for 2010 Int. World-Wide Web Conf. (Performance, Scalability, and Availability Area)
  - Vice Chair for 2006 Int. World-Wide Web Conf. (Performance Track)
  - PC Chair for the 3d IEEE Workshop on Internet Applications (WIAPP), 2003.
  - PC Co-Chair for the 6th Int. Workshop on Web Caching and Content Distribution (WCW), 2001.
- General Chair of the 9th Passive and Active Measurements Conference (PAM), 2008.
- An Industrial Program Co-Chair: ACM SIGMOD Conference, 1999.
- Member of Program Committees:
  - Int. World-Wide Web Conf., 2000, 2004, 2007, 2008, 2009, 2011, 2013, 2020, 2021, 2022;
  - Passive and Active Measurement Conf. (PAM), 2013, 2014, 2017;
  - IEEE/ACM Symposium on Edge Computing, 2017, 2019, 2020;
  - ACM Multimedia Conf., 2011;
  - ACM Internet Measurement Conf. (IMC), 2010;
  - Int. Conf. on Web Informations Sys. Engineering (WISE), 2010;
  - ACM/IFIP/USENIX Int. Middleware Conf., 2006;
  - IEEE Int. Conf. on Distr. Computing Sys. (ICDCS), 1999, 2004, 2017;
  - IEEE Int. Perf. and Computer Communication Conf. (IPCCC), 2000, 2001;
  - ACM SIGMOD Int. Conf. on Management of Data, 2002, 2003, 2005;
  - Annual Conf. on Very large Databases (VLDB), 2000, 2007;
  - IEEE Int. Conf. on Data Engineering (ICDE), 1998, 2002, 2006;
  - Int. Conf. on Advanced Information Systems Engineering (CAiSE), 2003;
  - ACM Int. Conf. on Inf. and Knowledge Management (CIKM), 2000;
  - 5th Int. Workshop on Content Delivery Networks (CDN), 2010;
  - GreenMetrics Workshop, 2009;
  - The 16th IEEE Workshop of Local and Metropolitan Area Networks (LANMAN), 2008;
  - Int. Workshop on Advanced Architectures and Algorithms for Internet Delivery and Applications (AAA-IDEA), 2005, 2006;
  - Workshop on Internet Server performance (WISP), 1999;
  - Int. Workshop on Web Caching and Content Distribution (WCW), 1999, 2002;

  - IEEE HotWeb Workshop (2015, 2016, 2017);
  - Int. Workshop on Advanced Issues of E-Commerce and Web-based Information Systems (WECWIS), 2000;
  - IEEE Workshop on Internet Applications (WIAPP), 2001.

- Reviewing:
  - NSF and DoE panelist.
  - University Tenure and Promotion Reviews: Northwestern U., Duke, Kansas State, U. of Pittsburgh, Northeastern U, North Carolina State U., Wayne State U., George Mason University, WPI, University of Missouri
  - External Member of Doctoral Thesis Committees: Georgia Tech (for Richard Liston and Pradnya Karbhari), UCDS (for Leeann Bent), WPI (for Wei Zhang), Univ. of Calgari (for Aniket Mahanti), Vrije Universiteit, Amsterdam (for Swaminathan Sivasubramanian and Jiang Dejun).
  - Reviewer for numerous journals and conferences (2000 and 2001 Outstanding Reviewer Awards from *Internet Computing*).

- Invited talks and tutorials:
  - Tutorial "Web caching and replication"; VLDB'98.
  - Invited talks at Worldnet+Interop'98; ComNet'99; DIMACS Workshop on Resource Management and Scheduling in Next Generation Networks (2001); IEEE Computer Communications Workshops (2001, 2005).
  - Keynote talk at the 9th Int. Workshop for Web Caching and Content Delivery (2004).
  - Numerous seminar and colloquium talks in universitites and industrial labs.

- Panel chairing:
  - "Do we need more Web performance research?" (WWW'2005)
  - "The future of the Web infrastructure industry and research" (WWW'2003)
  - "WWW and the Internet - did we (the database community) miss the boat?" (ICDE'98);
  - "Workflow research and workflow products - anything in common?" (CAiSE'98), co-chair.

- Selected University Service:
  - CS Graduate Studies Committee (Chair: 2006/07 AY, 2007/08 AY, 2009/10 AY; Member: 2005/06 AY, Fall'2008, Fall'2020 - present)
  - CS Faculty Hiring Committee (Chair: Spring'2011, 2016/17 AY; Member: 2006/07 AY)
  - EECS Facilities committee (2006/07 AY)
  - EECS External Relations Committee (Fall'2006)
  - Case School of Engineering Executive Committee (2017/18 AY)
  - Case School of Engineering Strategic Faculty Hiring Committee (2015–2017)
  - Case School of Engineering Promotion and Tenure Committee (2008/09 AY, 2014/15 AY)
  - Search Committee for Case School of Engineering IT Director (December 2009)
  - Search Committee for MSE-CDS joint faculty position (2021 - present)
  - University Senate Information Technology Committee (2015–2017, 2019-present)