David D. Clark
Curriculum Vitae
May 2020

Personal

Address: MIT Computer Science and Artificial Intelligence Laboratory

Stata Center, 32 Vassar Street

Cambridge, MA 02139

Phone: (617) 253-6003

Email: ddc@csail.mit.edu

Education

Swarthmore College, BS in Electrical Engineering, 1966. Graduated with distinction.

MIT, MS in Electrical Engineering and Computer Science, 1969.

MIT, PhD in Electrical Engineering and Computer Science, 1973.

Principal Fields of Interest

The design of communications network technology, architecture and protocols, with a specific focus on the Internet. New applications of networks. Operating systems and networks. Computer and communications security. Societal implications of networking.

Employment

1973-present: Computer Science and Artificial Intelligence Laboratory (formerly the Laboratory for Computer Science), MIT.

Current position: Senior Research Scientist

      Leader, Advanced Network Architecture group

Consulting and Related Outside Activities

(Partial listing)

Bellcore Consultant 1994-1995

MCI Consultant 1994-1996

Time Warner Cable Consultant 1997-1998

FTP Software Director 1995-1998

SOCAN Witness—Canadian Copyright Hearing 1998

HP Labs Consultant 1997-1999

Openroute, Inc. Director, Consultant 1984-1999

Nexabit Advisory committee 1988-1999

Broadband Access Systems Advisory committee 1999-2000

ATT Advisory committee 1999-2001

Invisible Worlds, Inc Advisory committee 1998-2001

Interop, Inc. Tutorial Instructor 988-2002

Morgan Kaufmann Publishers Networking series editor 1996-2005

Chiaro Networks Advisory committee 2000-2004

Telcordia Advisory committee 1998-2002

Ernst & Young Consultant various

Packet Design Technical Advisory 2001-2004

British Telecom Technical Advisory Board 2003-2005

Fish&Richardson (Vernit) Expert Witness 2007-2008

FCC Technical Advisory Boards 2012-2016

Massachusetts Broadband Institute Board of Directors 2013-present

AT&T Consulting (Independent Measurement Expert) 2016 2017

McCarthy & Tetrault LLP Expert Witness 2017

Broadband Internet Technical Advisory Group 2017

Societies and Honors

2002: American Academy of Arts and Sciences
2000: IEEE ComSoc Award for Public Service in Telecommunications
1999: Fellow, ACM
1998: IEEE Hamming Award
1998: Fellow, IEEE
1997: National Computer Systems Security Award
1996: National Academy of Engineering
1995: IEEE Award in International Communication
1991: Federal Computer Week, Federal 100 Award
1990: ACM SigComm Award
1966: Sigma Xi
1966: Thomas B. McCabe Award, Swarthmore College, for outstanding student in engineering
1965: Sigma Tau
Memberships: ACM (fellow), IEEE
(Fellow)

Professional Activities

Member: National Academies Cyber-resilience Forum 2016-present
Chairman: Computer Science and Telecommunications Board, National Research Council 1996- 2004
Chairman: Internet Research Task Force, 1989-1991
Chairman: Internet Activities Board 1981-1989 Chairman: National Research Council study committee on computer and communications security 1989-1990
Member: National Research Council study committees on networking and information infrastructure 1987-1988, 1993-1994 and 1994-1996
Member: National Research Council study committee on residential broadband 2000-2001
Program co-chair: ACM SigComm 1995
Program co-chair: 10th Data Communications Workshop
Treasurer: 9th Symposium on Operating Systems Principles

Summary of Research

Dr. Clark graduated from Swarthmore College in 1966, and received his PhD from MIT in 1973. He has worked since then at the MIT Computer Science and Artificial Intelligence Laboratory (formerly the Laboratory for Computer Science), where he is currently a

Senior Research Scientist. Dr. Clark's research interests include networks, network protocols, operating systems, distributed systems, and computer and communications security.

After receiving his PhD, he worked on the early stages of the ARPAnet and managed the development of one of the first host implementations of the ARPA network protocols. Following this effort, he worked on local area network technology, and was one of the developers of the token ring LAN. This effort led directly to commercial products, and helped stimulate the IEEE 802.5 token ring standard.

Since the mid 1970s, Dr. Clark has been involved in the development of the Internet protocol suite. From 1981-1989 he acted as Chief Protocol Architect in this development and chaired the Internet Activities Board, a steering committee that guides the evolution of the Internet protocols. He resigned from the IAB in 1991 to concentrate on advanced research.

As a part of his work in protocols, Dr. Clark made an extensive study of protocol efficiency. He guided the design and implementation of the SWIFT operating system at MIT, which demonstrated that a major impediment to effective data throughput is the internal structure of existing operating systems. His investigation of protocol overhead has led to a new set of principles for protocol organization that offers easier implementation of high-performance systems and better structure for achieving flexible service features. He has presented tutorials on problems of protocol performance and written implementation notes for TCP.

In the 1990s, his research interests included protocols and architectures for very large and very high- speed networks. Specific activities include the development of methods to support real-time traffic in the Internet, new models of network service to support distributed information systems, and approaches to pricing of the Internet. He started an effort to look at networking issues for the Post PC computing era—appliances, portable devices, and embedded computers. He is developing a new architectural model of the Internet.

In the security area, Dr. Clark participated in the early development of the multi-level secure Multics operating system. He consulted on the development of a secure version of the Internet architecture. He developed an information security model derived from commercial practices, a model which stresses integrity of data rather than disclosure control. He chaired a study committee of the National Research Council on computer and communications security. His recent work includes work on BGP and DNS security.

Since the mid 1990's, Dr. Clark has become involved in policy issues surrounding telecommunications and IT broadly. He has published papers on Internet and policy, and heads an MIT interdisciplinary program on technology/policy issues surrounding the Internet. In 2003 Dr. Clark launched the Communications Futures Program at MIT, a multi-

lab, multi-disciplinary program to look at the future of the communications industry.

Starting in 2000, with the NewArch project, Clark has looked at possible architectural alternatives to the current Internet. He helped coordinate the NSF Future Internet Architecture project.

Dr. Clark is a fellow of the IEEE and the ACM. In 1990 he received the ACM SigComm award for his work on the Internet, and was recognized by *Federal Computer Week* in its Federal 100 award. In 1995 he received the IEEE Award in International Communication, and in 1998 the IEEE Hamming Award for his work on the Internet. He received the National Computer Systems Security Award in 1997. He received the IEEE Communications Society Award for Public Service for his contributions to better understanding of the Internet. He chaired the NRC Computer Science and Telecommunications Board from 1996 to 2004.

Books and book chapters

1. Choucri, Nazli and David Clark, *International Relations in the Cyber Age: The Co-Evolution Dilemma,* MIT Press, 2018
2. Clark, David, *Designing an Internet*. MIT Press 2018.
3. Clark, David, et al, "Institutional Arrangements and Internet Architecture, Interconnection
4. in the Internet: peering, interoperability and content delivery", in *Handbook on the Economics of the Internet,* Bauer, J.M., Latzer, M, Edward Elgar Publishing, 2016.
5. Clark, David, "The Role of Trust in Cyberspace, in *Trust, Computing, and Society.* Cambridge. Ed Harper, Richard, et al Cambridge University Press, 2014.
6. Clark, David D. and, Blumenthal, Marjory S., "The Future of the Internet and Cyberpower" In *Cyberpower and National Security.* Ed. Franklin D. Kramer, et al, Washington, DC: National Defense University/Potomac Books, Inc., 2009: 206-240
7. Jayant, N, et. al. *Broadband: Bringing home the bits.* Computer Science and Telecommunications Board, National Academies Press, 2002.
8. Clark, D. D. "An introduction to internet telephony". *In internet Telephony*, L. W. McKnight,
9. W. Lehr, and D. D. Clark, Eds. MIT Press, Cambridge, MA., 2001.
10. Clark, D. "Implications of Local Loop Technology for Future Industry Structure", in *Competition, Regulation and Convergence: Current trends in telecommunications policy research*, edited by S. Gillett and I. Vogelsang, Lawrence Erlbaum Associates, 1999.
11. Clark, D. "A Taxonomy of Internet Telephony Applications", in *Telephony, the Internet, and the Media*, edited by J MacKie-Mason and D. Waterman, Lawrence Erlbaum Associates, 1998.
12. Clark, D., "Internet Cost Allocation and Pricing", in *Internet Economics*, edited by L. McKnight and J. Bailey, MIT Press, 1997.
13. Clark, D., "Combining Sender and Receiver Payments in the Internet", in *Interconnection and the Internet: Selected Papers from the 1996 TPRC*, edited by Gregory Rosston and David Waterman, Lawrence Erlbaum Associates, 1997.
14. Branscomb, L., Clark, D., et al., *The Unpredictable Certainty: Information Infrastructure Through 2000*, Report by the NII 2000 Steering Committee of the Computer Science and Telecommunications Board, National Research Council, March 1996.

15. Clark, D., Foreword in *IPng Internet Protocol Next Generation* edited by S. Bradner and A. Mankin, Addison-Wesley, Reading, MA, 1995.
16. Kleinrock, L., and Clark, D., et al, *Realizing the Information Future: The Internet and Beyond,* Report by the NRENAISSANCE Committee of the Computer Science and Telecommunications Board, National Research Council, June 1994.
17. Clark, D., et al, *Computers at Risk*: *Safe Computing in the Information Age*, Report by the System Security Study Committee of the Computer Science and Telecommunications Board, National Research Council, March 1990.

Refereed Publications
1. C. Testart, P. Richter, A. King, A. Dainotti, and D. Clark, "To Filter or not to Filter: Measuring the Benefits of Registering in the RPKI Today", in Passive and Active Measurement Conference (PAM), Jan 2020.
2. C. Testart, P. Richter, A. King, A. Dainotti, and D. Clark, "Profiling BGP Serial Hijackers: Capturing Persistent Misbehavior in the Global Routing Table", in ACM Internet Measurement Conference (IMC), Oct 2019.
3. W. Lehr, D. Clark, S. Bauer, and k. claffy, "Regulation When Platforms Are Layered", in Telecommunications Policy Research Conference (TPRC), Sep 2019.
4. D. Clark and k. claffy, "Toward a Theory of Harms in the Internet Ecosystem", in Telecommunications Policy Research Conference (TPRC), Sep 2019.
5. A. Dhamdhere, D. Clark, A. Gamero-Garrido, M. Luckie, R. Mok, G. Akiwate, K. Gogia, V. Bajpai, A. Snoeren, and k. claffy, "Inferring Persistent Interdomain Congestion", in ACM SIGCOMM, Aug 2018.
6. D. Clark, A. Dhamdhere, M. Luckie, and k. claffy, "Policy Implications of Third-Party Measurement of Interdomain Congestion on the Internet", in Telecommunications Policy Research Conference (TPRC), Mar 2018.
7. k. claffy, D. Clark, S. Bauer, and A. Dhamdhere, "Policy challenges in mapping Internet interdomain congestion", Journal of Information Policy, Vol. 10, 2020. First presented at Telecommunications Policy Research Conference (TPRC), Oct 2016.
8. Claffy, k.c., David Clark, Adding Enhanced Services to the Internet: Lessons from History". Journal of Information Policy, Vol. 6, 2016. First presented at Telecommunications Policy Research Conference (TPRC), Oct 2015.
9. Clark, D., Bauer, S, Lehr, W, Claffy, K.C., Dhamdhere, A.D., Huffaker, B., Luckie, M. "*Measurement and Analysis of Internet Interconnection and Congestion"*, Journal of Information Policy, Vol 4 (2014)
10. Luckie, M., Dhamdhere, A.D., Clark, D., Huffaker, B., Claffy, K.C. *"Challenges in inferring Internet Interdomain Congestions"* Working Paper Series, (2014)
11. Claffy, k.c., Clark, D. "*Platform Models for Sustainable Internet Regulation*" TPRC 41, Vol. 4 (2013)
12. Clark, D., Blumenthal, M.S. "*The End-to-End Argument and Application Design: The Role of Trust*" Federal Communications Law Review Vol 32, No. 2. March (2011)
13. Clark, D., Landau, S. "*Untangling Attribution*" Harvard National Security Journal, Vol. 2, Issue 2 (2011) an earlier version appeared in Proceedings of a Workshop on Deterring

Cyberattacks: Informing Strategies and Developing Options for U.S. Policy, National academies Press (2010)

14. Bauer, S., Clark, D., Lehr, W. "*Powerboost*", HomeNets '11 Proceedings of the 2nd ACM SIGCOMM workshop on Home Networks (2011)

15. Lehr, W., Bauer, S., Heikkinen, M., Clark, D. "*Assessing Broadband Reliability: Measurement and Policy Challenges*" TPRC (2011)

16. Clark, D. D., Lehr, W., Bauer, S. "*Interconnection in the Internet: The Policy Challenge*" TPRC (2011)

17. Bauer, S., Clark, D.D., Lehr, W. "*Understanding Broadband Speed Measurements*" TPRC (2010) Brown, I., Clark D., Trosssen, D. "*Should specific values be embedded in the internet architecture?*" ReARCH '10 "Proceedings of the Re-Architecting the Internet Workshop (2010)

18. Clark, D., Landau, S. "*The problem isn't attribution: it's multi-stage attacks*" ReARCH '10 "Proceedings of the Re-Architecting the Internet Workshop (2010)

19. Estrin, D., Chandy, K.M., Young, R.M., Smarr, L., Odlyzko, A., Clark, D., et.al. "*Internet Predictions*" IEEE Internet Computing, Volume 14, Issue 1, January (2010)

20. Bauer, S., Clark, D., Lehr, W. "*The Evolution of Internet Congestion*" TPRC (2009)

21. Clark, D., "*A simple cost model for broadband access: What will video cost?*" TPRC (2008)

22. Clark, D., "*Network Neutrality: Words of Power and 800-Pound Gorillas*" International Journal of Communication 1 (2007)

23. Clark, D., Blumenthal, M.S., "*The end-to-end argument and application design: the role of trust*" TPRC (2007)

24. Faratin, P., Clark, D, Gilmore, P. Bauer, S., Berger, A., Lehr, W. "*Complexity of Internet Interconnections: Technology, Incentives and Implications for Policy*" TPRC (2007)

25. Clark, D., Lehr, W., Faratin, P., Bauer, S., Sami, R., Wroclawski, J. "*The Growth of Internet Overlay Networks: Implications for Architecture, Industry, Structure and Policy*" TPRC (2005)

26. Clark, D. D., Partridge, C., Braden, R. T., Davie, B., Floyd, S., Jacobson, V., Katabi, D., Minshall, G., Ramakrishnan, K. K., Roscoe, T., Stoica, I., Wroclawski, J., and Zhang, L. "*Making the world (of communications) a different place*". Comput. Commun. Rev. 35, 3 Jul. 2005.

27. Clark, D. D., Wroclawski, J., Sollins, K. R., and Braden, R. 2005. "*Tussle in cyberspace: Defining tomorrow's Internet*". IEEE/ACM Trans. Netw. vol. 13, num. 3, Jun. 2005.

28. Clark, D. D., Sollins, K., Wroclawski, J., and Faber, T. "*Addressing reality: an architectural response to real-world demands on the evolving Internet*". In Proceedings of SIGCOMM 2003, workshop on *Future Directions in Network Architecture,* pp. 247-257, Aug. 2003.

29. Clark, D., Braden, R., Falk, A., and Pingali, V., 2003. "*FARA:* Reorganizing the addressing architecture". In Proceedings of the 2003 SIGCOMM workshop on, *Future Directions in Network Architecture*, pp. 313-321, Aug., 2003.

30. Clark, D. D., Partridge, C., Ramming, J. C., and Wroclawski, J. T. 2003. "*A knowledge plane for the internet*". Proceedings of SIGCOMM 2003, Karlsruhe, Germany, August 25 - 29, 2003. Comput. Commun. Rev. vol. 33, no. 4, pp. 3-10, Oct., 2003.

31. Clark, D.D., "*Economics and the Design of Open Systems*", IEEE Internet Computing, vol. 7, no. 2, pp. 94-96, March, 2003.

32. Clark, D., J Wroclawski, K. Sollins, R. Braden. "T*ussle in Cyberspace: Defining Tomorrow's Internet*", Proceedings of the ACM SigComm 2002 Conference, Pittsburg, PA August, 2002, Computer Communications Review, vol. 32, num. 4, Oct 2002.

33. S. E. Gillett, W. H. Lehr, J. T. Wroclawski , D. D. Clark. "*The Disruptive User - Internet Appliances and the Management of Complexity*", BT Technology Journal, Volume 19 Issue 4, October 2001.

34. Blumenthal, M, and D. Clark, "Rethinking the design of the Internet: The end-to-end arguments vs. the brave new world". *ACM Transactions on Internet Technology*. Version also to appear in *Communications Policy in Transition: The Internet and Beyond*, B. Compaine and S. Greenstein, eds, MIT Press, Sept. 2001.

35. Clark, D. and Wenjia Fang, "*Explicit Allocation of Best-EFfort Packet Delivery Service*" IEEE/ACM Transactions on Networking, vol. 6, no. 4, pp. 362-373, Aug. 1998.

36. Clark, D.D. Feigenbaum, E.A. Hartmanis, J. Lucky, R.W. Metcalfe, R.M. Reddy, R. Shaw, M., "Innovation and obstacles", *Computer*, vol. 31, no. 1, pp. 29-38, Jan. 1998.

37. Leiner, B. M., Cerf, V. G., Clark, D. D., Kahn, R. E., Kleinrock, L., Lynch, D. C., Postel, J., Roberts, L. G., and Wolff, S. S. 1997. "*The past and future history of the Internet*". Commun. ACM vol. 40, no. 2, pp. 102-108, Feb. 1997.

38. Clark, D., "Interoperation, Open Interfaces, and Protocol Architecture", *White papers: The Unpredictable Certainty*, National Academy Press, Washington, D.C. 1997.

39. Clark, D., "*Adding Service Discrimination to the Internet*", Proceedings of the 23rd Annual Telecommunications Policy Research Conference (TPRC), Solomons, MD, October 1995. Also appeared in *Telecommunications Policy*, Vol. 20, No. 3, April 1996.

40. Shenker, S., Clark, D, et al., "Pricing in computer networks: reshaping the research agenda", *Telecommunications Policy*, Vol. 20, No. 3, April 1996.

41. Shenker, S., Clark, D., and Zhang, L., "A Scheduling Service Model and a Scheduling Architecture for an Integrated Services Packet Network", submitted for publication.

42. Charny, A., Clark, D., and Jain, R., "Congestion Control With Explicit Rate Indication", *Proceedings of the ICC Conference*, June 1995.

43. Clark, D. D. "The design philosophy of the DARPA Internet Protocols". SIGCOMM Comput. Commun. Rev. 25, no. 1, pp. 102-111, Jan. 1995.

44. Shenker, S., Clark, D., and Zhang, L., "Services or Infrastructure: Why We Need a Network Service Model", *Proceedings of the 1st International Workshop on Community Networking*, IEEE, July 1994.

45. Davie, B., Smith, J., Clark, D., et al. "AURORA: An Experiment in Gigabit Network Technologies", in *High Performance Communications,* ed. Ahmed Tantawy, Kluwer Academic Publications, Jan 1993.

46. Clark, D., et al., "The AURORA Gigabit Testbed", *Computer Networks and ISDN Systems*, **25**(6), January 1993.

47. Clark, D., et al., "An Overview of the AURORA Gigabit Testbed", in *Proceedings, INFOCOM 1992*, Florence, Italy, 1992.

48. Jamin, S., Shenker, S., Zhang, L., and Clark, D., " An Admission Control Algorithm for Predictive Real-Time Service", *Proceedings of the 3rd International Workshop on Network and Operating System Support for Audio and Video*, ACM/IEEE, November 1992.

49. Clark, D., Shenker, S., and Zhang, L., "Supporting Real-Time Applications in an Integrated Services Packet Network: Architecture and Mechanism", *Proceedings of SigComm 1992 Conference*, ACM, August 1992.

50. Zhang, L., Shenker, S., and Clark, D., "Observations on the Dynamics of a Congestion Control Algorithm: The Effects of Two-Way Traffic", *SigComm 9I Conference,* ACM, September pp. 133-148, 1991.

51. Zhang, L., and Clark, D., "Oscillating Behavior of Network Traffic: A Case Study Simulation", *Internetworking Research and Experience*, Vol. 1, No. 2, pp. 101-112, December 1990.

52. Shenker, S., Zhang, L., and Clark, D., "Some Observations on the Dynamics of a Congestion Control Algorithm", *Computer Communication Review, Vol.* 20, No. 5, pp. 30-39, October 1990.

53. Clark, D., and Tennenhouse, D., "Architectural Considerations for a New Generation of Protocols", *SigComm Symposium,* ACM, September 1990.

54. Clark, D., ''Policy Routing in Internetworks", *Internetworking Research and Experience,vol.* l, no. l, pp. 35-52, September 1990.

55. Clark, D., Jacobson, V., Romkey, J., and Salwen, H., "An Analysis of TCP Processing Overhead", *IEEE Communications Magazine, Vol.* 27, No. 6, pp. 23-29, June 1989.

56. Clark, D., Romkey, J., and Salwen, H., "An Analysis of TCP Processing Overhead", *13th Conference on Local Computer Networks,* IEEE, October 1988.

57. Clark, D. and Wilson, D., "Evolution of a Model for Computer Integrity", *11th National Computer Security Conference,* Postscript to Proceedings, NIST/NCSC, pp. 14-27 October 1988.

58. Clark, D., "The Design Philosophy of the DARPA Internet Protocols", In Proceedings from *SIGCOMM Symposium,* ACM, pp. 106-114, August 1988.

59. Clark, D., and Wilson, D., "A Comparison of Commercial and Military Computer Security Policies", *Proceedings of the 1987 IEEE Symposium on Security and Privacy,* IEEE, Oakland, CA, pp. 184-194, April 1987.

60. Clark, D., Lambert, M., and Zhang, L., "NETBLT: A High Throughput Transport Protocol'', *Frontiers in Computer Communications Technology:* Proceedings of the *ACM-SIGCOMM '87,* Association for Computing Machinery, Stowe, VT, pp. 353-359, August 1987.

61. Sollins, K., and Clark, D., "Distributed Name Management", *Proceedings of the IFIP WG 6.5 International Computer Message Systems Working Conference,* IFIP WG 6.5, Munich, Germany, pp. 2.3.1-1.3.19, April 1987.

62. Clark, D., "The Structuring of Systems Using Upcalls", Proceedings of the 10th *ACM Symposium on Operating Systems Principles,* Association for Computing Machinery, December pp. 171-180, 1985.

63. Saltzer, J., Clark, D., Romkey, J., and Gramlich, W., "The Desktop Computer as a Network Participant", *IEEE Journal on Selected Areas in Communications, Vol.* SAC-3, No. 3, pp. 468-478, May 1985.

64. Saltzer, J., Reed, D., and Clark, D.D., "End-to-End Arguments in System Design", *ACM Transactions on Computer Systems, Vol.* 2, No. 4, pp. 277-288, November 1984.

65. Clark, D., Halstead, B., Keohan, S., Sieber, J., Test, J., and Ward, S., "The Trix 1.0 Operating System", *Distributed Processing Quarterly: Special Issue on Distributing Operating Systems,*

Vol. l, No. 2, pp. 3-5, Published by the IEEE Computer Society Technical Committee on Distributed Processing, December 1981.

66. Saltzer, J., and Clark, D., "Why A Ring", Proceedings of the *Seventh Data Communications Symposium,* IEEE, Mexico City, Mexico, pp. 211-217, October 1981.

67. Saltzer, J., Reed, D., and Clark, D., "Source Routing for Campus-Wide'', Proceedings of the *IFIP Working Group 6.4, International Workshop on Local Networks,* Zurich, Switzerland, published in *Local Networks for Computer Communications*, pp. l-25 by North Holland Publishing Company, August 1980.

68. Clark, D., and Svobodova, L., "Design of Distributed Systems Supporting Local Autonomy", Proceedings of COMPCON '80, IEEE, San Francisco, CA, Invited Paper, February 1980.

69. Clark, D., Pogran, K., and Reed, D., "An Introduction to Local Area Networks", Proceedings of th*e IEEE,* IEEE, pp. 1497-1517, November 1978.

Other Publications

1. Clark, David, et al, Open Internet Advisory Committee, Federal Communications Commission. Open Internet Advisory Committee 2013 Annual Report. https//transition.fcc.gov/cgb/oiac/oiac-2013-annual-report.pdr.2013, pp 68.81

2. Clark, David, Bauer, S., claffy, k.c., "Approaches to Transparency Aimed at Minimizing Harm and Maximizing Investment; Comment In the Matter of Protecting and Promoting the Open Internet", GN Docket No. 14-28. http://www.caida.org/publications/papers/2014/approaches_to_transparency_aimed/ .2014.

3. Clark, D. *An Insiders Guide to the Internet" Version 2.0,* July 25, 2004

4. Clark, D. "The Internet of Tomorrow". *Science* vol. 285, p.353 July 16, 1999.

5. Clark, D. "High-Speed Data Races Home", *Scientific American*, pp 95-99, October 1999.

6. Anna Charny and David D. Clark and Raj Jain, "Congestion Control With Explicit Rate

7. Indication," ATM Forum, ATM Forum/94-0692, Jul. 1994.

8. Braden, R., Clark, D., and Shenker, S., "*Integrated Services in the Internet Architecture: An Overview,*" RFC -1633, June 1994.

9. Braden, R., Clark, D., Crocker, S., and Huitema, C., "R*eport of the IAB Workshop on Security in the Internet Architecture*," RFC-1636, June 1994.

10. Braden, R., Clark, D., and Shenker, S., "*Integrated Services in the Internet Architecture: An Overview*," RFC-1633, May 1994.

11. Clark, D., "*Policy Routing in Internet Protocols*", NIC-RFC-1102, Network Information Center, SRI International, 1989.

12. Wilson, D., Anderson, R., and Clark, D., "See-Through Security -- A New Approach for Authenticating End Users in an Open Network*", MlS Week*, 1986.

13. Clark, D., "*Window and Acknowledgement Strategy in TCP*", NIC-RFC-813, DDN Protocol Handbook, Vol. 3, pp. 3-5 to 3-26, July 1982.

14. Clark, D., "*Name, Addresses, Ports, and Routes*", NIC-RFC-814, DDN Protocol Handbook, *Vol.* 3, pp. 3-27 to 3-40, July 1982.

15. Clark, D., "*IP Datagram Reassembly Algorithms*", NIC-RFC-815, DDN Protocol Handbook, Vol. 3, pp. 3.41-3.49, July 1982.

16. Clark, D., ''*Fault Isolation and Recovery*'' NIC-RFC-816, DDN Protocol Handbook, No. 3, pp. 3.51-3.62, July 1982.
17. Clark, D., "*Modularity and Efficiency in Protocol Implementation*", NIC-RFC-817, DDN Protocol Handbook, Vol. 3, pp. 3.63-3.88, July 1982.
18. Clark, D., editor, "*Ancillary Reports: Kernel Design Project*", Technical Report TM-87, Massachusetts Institute of Technology, June 1977.
19. Schroeder, M., Clark, D., Saltzer, J., and Wells, D., "*Final Report of the Multics Kernel Design Project*", Technical Report LCS-TR-196, Massachusetts Institute of Technology, June 1977.
20. Clark, D., *An Input/Output Architecture for Virtual Memory Computer Systems,* PhD dissertation, Massachusetts Institute of Technology, January 1974.
21. Clark, D., Graham, R., Saltzer, J., and Schroeder, M., "*The Classroom Information and Computing Service*", Technical Report TR-80, Massachusetts Institute of Technology, January 1971.

Presentations

1. Clark, D., *Is it time to re-invent the Internet?* Invited talk, University College, London, England, March, 2007.

2. Clark, D., *Is the Internet Broken? How should it be fixed?* Invited talk, 25th Annual Seminar Series, MIT Club, Bethesda, MD. November, 2006 and Engineering Colloquium, Goddard Space Flight Center, Greenbelt, MD., November, 2006.

3. Clark, D., *Conceiving an Internet for Tomorrow*. Distinguished Lecture: Columbia University CS Department, New York, N.Y., October, 2006.

4. Clark, D., *Conceiving a Network for Tomorrow: Design for Tussle.* MIT Technology Policy Program, 30th Anniversary Lecture, Cambridge, MA., April 2006

5. Clark, D., *Why the Internet is the way it is (and why it will be very different in ten years)*, Oxford University: Oxford Internet Institute and Lady Margaret Hall College, April, 2006.

6. Clark, D., Lehr, W., Bauer, S., Faratin, P., Sami, R., Wroclawski, J. *The Growth of Internet Overlay Networks: Implications for Architecture, Industry Structure and Policy*. 34th Telecommunications Policy Research Conference (TPRC 05), Arlington, V.A., September, 2005.

7. David, D., *Does Computer Science have Fundamental Design Principles?* Invited talk, Saul Gorn Memorial Lecture Department of Computer and Information Science, University of Pennsylvania, April, 2004

8. Clark, D., *Disrupting the disruption: The revenge of end to end,* Tampere University of Technology, Tietotalo, Finland, March, 2003.

9. Clark, D., Spectrum Policy, *The Internet and Open Access*. Quello Center Lecture, Michigan State University, East Lansing, M.I., November, 2002.

10. Clark, D., *Deploying the Internet--why does it take so long, and can research help?* U.S. National Science Foundation, Washington DC, January, 2002.

11. Clark, D. *Exploring the Dynamics of the Internet,* Invited talk, International Conference On Complex Systems, Nashua, NH. May, 2000.

12. Clark, D. *Fiber-based Metropolitan access networks for Internet Access*, Invited talk, OFC Conference on Optical Fiber Communications, Baltimore, MD., March 2000.

13. Clark, D. *Evolution of the Internet Architecture for Multimedia Traffic,* Keynote address at ACM Multimedia 99, Orlando, FL., November 1999.

14. Clark, D. *Exploring the Dynamics of the Internet*, MIT LIDS Colloquium, Cambridge, MA., October
1999.

15. Clark. D., *Shaping the future of the Internet*, XIX Pacific Science Congress, Sidney, July 1999.

16. Clark, D. *Internet Telephony.* University of Washington Distinguished Lecture, March 1999.

17. Clark, D. *Controlling the Internet (Is it out of Control?)* CMU, Pittsburgh, Pa, January 1999.

18. Clark, D. *Controlling the Internet (Is it out of control?),* 4th Informs Telecomm Conference, Boca Raton, FL., March 1998; Cornell Distinguished Lecture, March 1998.

19. Clark, D. *The Future of the Internet*. Computer Science Colloquium, University of Virginia, Charlottesville, VA., March 1998.

20. Clark, D., *Critical Factors in the Growth of the Internet,* at Web, Wires and Waves, Smithsonian Institution, April 1997.

21. Clark, D., *The Internet: What is it and Where is it Going?*, Harvard Law School, Cambridge, MA October 1995.

22. Clark, D., *The NII vs. The Future of Networking,* Talk given at MIT-CNO Course, Cambridge, MA, July 1995.

23. Clark, D., *Reservations, Service Quality and Equality*, Tutorial given at Infocom, Boston, MA, April 1995.

24. Clark, D., *Evolution of Gigabit Networks and Protocols*, Gigabit Testbed Workshop, October 1994
.

25. Clark, D., *Security and the Open Data Network: How Do We Get There?* Keynote Speaker at Bellcore/NYNEX Computer and Network Security Symposium, Danvers, MA, May 1993.

26. Clark, D., *Elephants and Tea Leaves: Predicting the Future of Networks.* Distinguished Lecture given at Duke University, Durham, NC, April 1993.

27. Clark, D., *Rough Consensus and Running Code: Can it Continue?* Keynote Speaker at Interop, Washington, DC, March 1993.

28. Clark, D., *A Cloudy Crystal Ball -- Visions of the Future.* Internet Engineering Task Force Meeting, Boston, MA July 1992.

29. Clark, D., *Is hardware hard? Is software soft?* Keynote Address at HPCS '92 IEEE Workshop, Tucson, AZ, February 1992.

30. Clark, D., *Computers at Risk: Safe Computing in the Information Age.* Keynote Address at the National Computer Security Conference, Washington, DC, October 1991.

31. Clark, D., *Beyond Myth-Bashing -- Fundamental Limits to Network Performance.* Talk given at SIGCOMM '90, Philadelphia, PA (September 1990); Stanford University, Palo Alto, CA, (November 1990); University of Arizona, Phoenix, AZ (January 1991); University of British Columbia, Vancouver (February 1991).

32. Clark, D., *Abstraction and Sharing an Architectural View of Networking*. Invited talk, IEEE/LEOS Summer Topical Meetings 1990, Monterey, CA, July 1990.

33. Clark, D., *Why Networks Don't go Fast.* ELECTRO '86, Boston, MA, May 1986.

34. Clark, D., *A Survey of Current Trends in Networking.* IBM University Conference, Santa Clara, CA, November 1985.

35. Clark, D., *A Case Study: The Campus Network Plan for the Massachusetts Institute of Technology.*
    ACIS, IBM, Rockville, MD, January 1984 and March 1984.

36. Clark, D., *Protocol Implementation and Design: Practical Considerations.* Tutorial given at SIGCOMM '83, University of Texas, Austin, TX, March 1983.

PhD Theses Supervised

1. Wolf, J., Classes of defense for computer systems, 2015.
2. Sowell, J., Finding order in a contentious Internet, 2015.
3. Bauer, S., Congestion on the Internet: Operator responses, economic analysis and improving the network architecture, 2008.
4. Urzua, C., Architectural Innovation, Functional Emergence and Diversification in Engineering Systems, 2007.
5. Lee, G., CAPRI: A Common Architecture for Distributed Probabilistic Internet Fault Diagnosis, 2007.

6. Afergan, M., Applying the Repeated Game Framework to Multiparty Networked Applications, 2005.
7. Garfinkel, S., Design principles and patterns for computer systems that are simultaneously secure and usable, 2005.
8. Kulik, J., The design of a fast and flexible Internet subscription system using content graphics. 2004.
9. Yang, X., NIRA: a new Internet routing architecture, 2004.
10. Katabi, D., Decoupling congestion control and bandwidth allocation policy with application to high bandwidth-delay product networks, 2003.
11. Krairit, D., Liberalizing Development: Effects of Telecommunication Liberalization in Thailand and the Philippines, 2001.
12. Bailey, J. Intermediation and Electronic Markets: Aggregation and Pricing in Internet Commerce, 1998.
13. Charney, A., Providing QoS Guarantees in Input Buffered Crossbar Switches with Speedup, 1998.
14. Shepard, T., Decentralized Channel Management in Scalable Multihop Spread-Spectrum Packet Radio Networks, 1995.
15. Gawlick, R, Admission Control and Routing: Theory and Practice, 1995.
16. Troxel, G., Time Surveying: Clock Synchronization over Packet Networks, 1994.
17. Zhang, L., A New Architecture for Packet Switching Network Protocols, 1989.
18. Perlman, R., Network Layer Protocols With Byzantine Robustness, 1988.
19. Ng, P., Long Atomic Computations, 1986.
20. Kent, S., Protecting Externally Supplied Software in Small Computers, 1980.
21. Luniewski, A., The Architecture of an Object Based Personal Computer, 1979.
22. Montgomery, W., Robust Concurrency Control for a Distributed Information System, 1978.

MS Theses Supervised

1. Hussain, M., *Collaborative Innovation and User Experience Control Strategies for Monetization of QoS of Data by Cellular Operators*, 2013

2. Garcia, R., *Understanding the Performance of Broadband Networks through the Statistical Analysis of*

Speed Tests, 2011

3. Smith-Grieco, A., *The Internet as Recommendation Engine: Implications of Online*

*Behavioral
   Targeting*,
   2010

4. Min, J., *Cross-User Subsidy in Residential Broadband Service*,
2005

5. Masiello, E., *Service Identifcation in TCP/IP: Well-Known versus Random Port Numbers*,
2005

6. Aftab, O., *Economic Mechanisms For Efficient Wireless Coexistence,*
2002.

7. Wang, K. *2 RegionRED: a Congestion Control Mechanism for the High Speed Internet*,
2001.

8. Hoe, J., *Start-up Dynamics of TCP's Congestion Control and Avoidance Schemes*,
1995.

9. Charny, A., *An Algorithm for Rate Allocation in a Packet-Switching Network with Feedback*,
1994.

10. Lefelhocz, C., *Investigation of a Preemptive Network Architecture,*
1994.

11. Ndiaye, O., *An Efficient Implementation of an Hierarchical Weighted Fair Queue Packet
   Schedulerr*,
   1994.

12. Tso, M., *Using Property Specifications to Achieve Graceful Disconnected Operation in an
   Intermittent Mobile Computing Environment*, 1993.

13. Heybey, A., *Video Coding and the Application Level Framing Protocol Architecture*,
1991.

14. Desnoyers, P., *Congestion Control in Large Frame Relay Networks*,
1988.

15. Chien, A., *Congestion Control in Routing Networks*,
1986.

16. Feldmeier, D., *A CATV-Based High-Speed Packet-Switching Network Design*,
1986.

17. Comer, M., *Loose Consistency in a Personal Computer Mail System*,
1984.

18. Cooper, G., *An Argument for Soft Layering of Protocols*,
1983.

19. Lopez, L., *Gateway Congestion Control,*

1981.

20. Marcum, A., *A Manager for Named, Permanent Objects*,
1979.

21. Wyleczuk, R., *Timestamps & Capability-Based Protection in a Distributed Computer Facility*,
1979

.

22. Woltman, G., *Controlling Terminals with High-Level Protocols*,
1978.

23. Goldberg, H., *A Robust Environment for Program Development*,
1977.

24. Goldman, B., *Deadlock Detection in Computer Networks*,
1977.

25. Luniewski, A., *A Simple and Flexible System Initialization Mechanism*,
1977.

26. Mason, A., *A Layered Virtual Memory Manager*,
1977.

27. Broughton, J., *An Extensible Command Language for the Multics System*,
1976.

28. Huber, A., *A Multi-Process Design of Paging System*,
1976.

29. Newman, M., *Evaluation of a Processor's Performance by Modeling*,
1976.

30. Shibuya, M., *Recovery for the Duplicate Database Problem*,
1976.

31. Bratt, R., *Minimizing the Naming Facilities Requiring Protection in a Computing Utility*, 1975.