

# Joseph D. Touch, Ph.D.

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## Experience

*US Air Force (October 2006 – present) on-loan*

### Senior Network Engineer, TSAT Space Segment

Advising the Transformational Communications Satellite (TSAT) Program Office on network issues.

*USC / Information Sciences Institute (June 1992 – present)*

### Director, Postel Center (Oct. 2000 – present).

Coordinates visiting scholars, graduate scholarships, facilities, and funding.

### Project Leader (Oct. 1995 – present, Computer Scientist Jun. 1992 – Oct. 1995).

Leading the NSF FIND [Recursive Internet Architecture \(RNA\)](#) project, exploring the impact of protocol stack structure on network architecture. Participating in the NSF Engineering Research Center for Integrated Access Networks (CIAN), exploring optical Internet access networks. Ongoing research in the redesign of the military Internet (TCA), Instant Infrastructure, and embedded personal Internet devices. Manages teams of 2-3 full-time researchers and 5-7 graduate students.

Former project leader of:

- DARPA [POW](#) and [OCDMA](#): optical Internet WAN and LAN architectures.
- NSF [OptIPuter](#): high-speed security supporting optical high-performance computing.
- NSF [NetFS](#): a file system interface for network configuration.
- NSF [X-Tend](#): ongoing development of the X-Bone system for academic and research use.
- NSA Agile Tunnels: using floating tunnel links to avoid DDOS attacks.
- DARPA [ALN](#): using automated machine learning to tune transport protocols.
- DARPA [X-Bone](#) and [DynaBone](#): automated deployment and management of IP overlay networks and extensions for multilayer overlays to resist denial-of-service attacks.
- DARPA [Large-Scale Active Middleware](#): multicast web system for low-latency access.
- DARPA [ATOMIC-2](#): analyzed the performance of MD5 (code incorporated into Cisco IOS), developed a high-speed host gateway, designed dynamic routing for experimental LANs.
- DARPA [PC-ATOMIC](#): a high-speed i486 VL-bus interface for the ATOMIC LAN.

Developed a user interface for ISI's *mmcc* teleconference tool, ported Bellcore's Touring Machine teleconferencing tool to NeXTs.

### Research Associate Professor (CS Jun. 2002, EE joint Jun. 2003, CS Assistant Feb. 1994):

Taught [CSCI555 Advanced Operating Systems](#) (Springs 1994-1996), [CSCI558L Internetworking and Distributed Systems Lab](#) (Summer 2001), developed ISI's [Summer Graduate Research Experience Program \(SGREP\)](#) (1999-2004), advised 19 students. USC Ambassador (2004 – present).

*Innocent Venture Capital (Nov. 2000 – present)*

**Consultant.**

Assessing the technological feasibility of Internet, networking, and distributed systems concepts.

*Lehrman Group Council of Technology Advisors (Aug. 1999 – present)*

**Consultant.**

Assessing the technological feasibility of Internet and networking concepts.

*CTA / NASA Goddard Space Flight Center (Feb. 1992 – Jun. 1992)*

**Consultant.**

Assessed the networking issues of the EOS Intelligent Database Management system.

*Bell Communications Research (Jun. 1987 – Feb. 1988)*

**Resident Contractor, TSEP student.**

Developed algorithms for flow control in multicast packet networks. Designed and implemented multistage packet switch simulation tools.

*GTE Labs, Inc. (Summers 1983-84-85, Jan. 1986)*

**Consultant, IURP student.**

Designed telephone graphic user interface hardware, high-speed switching systems, infrared protocols, and diffuse infrared data separators.

## Education

*University of Pennsylvania*

Ph.D., May 1992, Computer and Information Science, Advisor: David J Farber, Dissertation Title: *Mirage: A Model for Latency in Communication*. Mirage was supported by DARPA's Information Science and Technology Office, contract NAG-2-639 entitled "Mirage" and AT&T Graduate Research Fellowship #111349.

*Cornell University*

M.S., August 1987, Computer Science, Advisor: Ken Birman.

*University of Scranton*

B.S., May 1985, *Summa cum Laude* with Honors, Biophysics and Computer Science, Presidential I (full-tuition, 4-year) Scholarship, Award for Excellence in Computer Science.

Honor societies: [Alpha Sigma Nu](#) (general, Jesuit; secretary), [Sigma Pi Sigma](#) (physics), [Upsilon Pi Epsilon](#) (computer science; chapter founder), [Sigma Xi](#) (scientific research, Assoc. 1984, Full 1993).

## Memberships

Member [IEEE](#) (student 1983, member 1992, senior 2002) [Comm. Society](#), [Computer Society](#)

Member [ACM](#) (student 1983, member 1992), [Sigcomm](#)

## Honors:

USAF TSAT Space Segment Civilian Quarterly Award (1Q2007), Yearly Award (2007)  
DARPA FTN Award for Excellence in Academic Research (2003)  
IEEE Senior member (2002)  
PTI Technology Achievement Winner (work with Santa Monica's Public Electronic Network) (1996)  
[Sigma Xi](#) (scientific research, Assoc. 1984, Full 1993)  
Who's Who – West (1996 –), World (1997 –), Science & Engr. (1998 –), Media & Comm. (1998 –),  
Finance and Industry (2003 –)

## Funding

PI	DARPA	<a href="#">PC-ATOMIC</a>	1994-1995 (1 year, \$340K)
PI	DARPA	<a href="#">ATOMIC-2</a>	1994-1997 (4 years, \$2.1M)
Co-author, PI	DARPA	<a href="#">LSAM</a>	1995-1998 (3 years, \$3M)
Author, PI	DARPA	<a href="#">X-Bone</a>	1998-2001 (3 years, \$2.5M)
Author, PI	DARPA	<a href="#">DynaBone</a>	2001-2004 (3 years, \$2M)
Author, PI	NSF	<a href="#">NetFS</a>	2001-2006 (4.5 years, \$480K)
Author, PI	NSF	<a href="#">X-Tend</a>	2002-2006 (3.5 years, \$500K)
Co-author, co-PI	DARPA	<a href="#">ALN</a>	2005-2006 (1 year, \$400K)
Author, PI	NSA	Agile Tunnels	2005-2006 (1 year, \$75K)
Author, PI	NSF	<a href="#">RNA</a>	2006-2009 (3 years, \$350K, current)
Author, PI	USAF	PROS	2006-2010 (4 years, \$1.4M, current)
Co-author, Co-PI	NSF ERC	<a href="#">CIAN</a>	2008-2013 (5 years, \$250K, current)
Co-author, co-PI	DII	OMPM	2008-2009 (1 year, TBA, pending)

## Research Areas

Virtual and overlay networks (incl. multilayer overlays, application deployment)  
Automated Internet configuration and deployment  
High-speed protocols and networks and network architecture (esp. Internet, Optical Internets)  
High performance / zero configuration network security protocols  
Empirical protocol, algorithm, and system performance (esp. TCP performance)  
Web cache design and performance (incl. multicast web caches)  
Latency reduction (esp. reducing connection and transmission latencies, and the use of anticipation)

## Professional Activities

### *Society/Organization Officer:*

[IEEE Communications Society: Internet TC](#) (co-chair 2000-2004), [TC on Gigabit Networking \(TCGN\)](#) (chair 1999-2001, vice-chair 1996-1999).

[ACM Sigcomm](#): Secretary/Treasurer 2002-2003, Conference Coordinator 2003-2007 (Emeritus 2007-present).

IANA Port Experts Team leader 2008-present

IETF Transport Area Directorate member 2008-present

### *Editorial Board member:*

[IEEE Network](#) 1997-present

[Elsevier's Journal of Computer and Systems Sciences](#) 2007-present

[Elsevier's Computer Networks](#) (and ISDN Systems, formerly) 1999-2006

### *Conference Steering Committees:*

IEEE Infocom Standing Committee 2005-present

IEEE Global Internet Steering Committee 2000-present

IEEE Workshop on Internet Applications Steering Committee 1999-2005

IARIA Int'l Conf. on Internet Surveillance & Protection (ICISP) Advisory Committee 2006

### *Conference/Workshop Technical Program Committees:*

ACM Sigcomm 2001 (Publicity Chair 2000, Finance Chair 2001)

ACM Sigcomm Asia Workshop 2005

ACM Sigcomm CoNext ReArch Workshop (Chair, 2008)

ACM Dynamic Interconnection of Networks Workshop (at Mobicom) 2005

ENext CoNext Workshop 2006-2007

IARIA Int'l Conf. on Internet Surveillance & Protection (ICISP) 2006

IEEE ICCCN Future Internet Arch. and Protocols 2008, Network Arch. and Protocols 2009 (Chair)

IEEE Infocom 1994-2003, 2005-present (Internet Co-chair 1999, TPC Chair 2006)

IEEE International Conference on Network Protocols (ICNP) 2002-2003, 2005-2006

IEEE Globecom FutureNet Workshop 2009

IEEE Global Internet Workshop 1996-1999, 2001-2006, 2008 (Chair 2005)

IEEE Symposium on Internet Services and Enabling Technologies (ISET) 2006

IEEE High-Speed (fmr. Gigabit) Netw. Workshop 1996-2009 (CoChair 1997, 1999; Chair 1998)

IEEE Conference on Networks for Grid Applications (GridNets) 2007

IEEE Openarch 2002-2003

IEEE Workshop on Internet Applications 1999-2001

IEEE Conference on High Speed Networks 1999, 2000

IEEE Network Storage Symposium 1999

IEEE Workshop on Long-Delay Broadband Networks 1997

IEEE Workshop on Computer Communications 1997

IFIP Protocols for High-Speed Networks 1994-2002 (Co-chair 1999)

Optical Internet Workshop 1997 (Chair)

Protocols for Future, Large-Scale and Diverse Network Transports (PFLDNeT) 2009

Physics of Computation Workshop 1994

SPIE Opticomm 2001 (Vice General Chair)

## Publications

### Patents

- P. V. Kumar, R. Omrani, J. Touch, A. Willner, P. Saghari, "[Code Cycle Modulation: Concept and Implementation](#)," U.S. Patent Disclosure, Univ. of Southern California, Nov. 2004. (patent pending)
- J. Touch, Y. Wang, L. Eggert, "Cooperative Network Boundary Traversal," U.S. Patent Disclosure, University of Southern California, Dec. 2003.
- J. Touch, Y. Wang, L. Eggert, "[System for Subnet Relocation](#)," U.S. Patent Disclosure, University of Southern California, Aug. 2002. (patent pending)
- J. Bannister, J. Touch, P. Kamath, A. Patel, J. McGeehan, A. Willner, "[A Method to Forward Internet Packets Without Conversion from an Optical to an Electronic Format](#)," U.S. Patent #7,369,766, University of Southern California, Sept. 2001. (granted May 6, 2008)
- J. Touch, D. Farber, "[Memory-side driven anticipatory instruction transfer interface with processor-side instruction selection](#)," U.S. Patent #5,353,419, Univ. of Penn., Sept. 1991 (granted Oct. 4, 1994).

### Books/Special Issues/Published Tutorials

- J. Touch, "[Components developed for all-optical Internet router](#)," SPIE Newsroom article ([PDF also available](#)), Sept. 24, 2008, DOI 10.1117/2.1200809.1294
- A. Azcorra, J. Touch, Z. Zhang, "[Selected Papers on Wireless and Mobility from IEEE INFOCOM](#)," *IEEE Transactions on Mobile Computing*, V6, N6, June 2007, pp. 577-578.
- K. Kobayashi, P. Vicat-Blanc, J. Touch, Guest Editors, Special Issue on the Protocols for Fast, Long-Distance Networks, *Computer Networks*, V51, 2007, pp. 1745-1747.
- J. Touch, "[Virtual and Overlay Networks](#)," IEEE Tutorials Now, 2005.
- J. Touch, "Overlay Networks," Chapter in *Practical Handbook of Internet Computing*, ed. M. P. Singh, CRC Press, Sept. 2004, ISBN 1-58488-381-2.
- M. Hofman, R. Kravets, J. Touch, Guest Editors, Special Issue on the Global Internet, *Computer Networks*, V45, 2004, pp. 1-3.
- J. Touch and J. Postel, "Network Infrastructure," Revised chapter in *Computational Grids: The Future of High-Performance Distributed Computing*, ed. I. Foster and C. Kesselman, Morgan Kaufmann/Elsevier, Nov. 2003, ISBN 1-55860-933-4.
- J. Touch, Guest Editor, Special Issue on Overlay Networks, *Computer Networks*, July 2001.
- J. Bannister, J. Senior, and J. Touch (eds.), *OptiComm 2001: Optical Networking and Communications*, Proceedings of the SPIE Vol. 4599, 2001.
- J. Sterbenz and J. Touch, *High Speed Networking: A Systematic Approach to High-Bandwidth Low-Latency Communication*, Wiley, 2001.
- J. Touch and J. Sterbenz (eds.), *Protocols for High Speed Networks VI*, Kluwer, 1999.
- J. Postel and J. Touch, "Network Infrastructure," chapter in *Computational Grids: The Future of High-Performance Distributed Computing*, ed. I. Foster and C. Kesselman, Morgan Kaufmann, Aug. 1998, ISBN 1-55860-475-8.

J. Touch, *Mirage: A Model for Latency in Communication*, Ph.D. Dissertation, Univ. of Pennsylvania, Dept. of Computer and Information Science (CIS) Tech. Report MS-CIS-92-42, DSL-11, Jan. 1992.

### *Refereed Journals*

P. Saghari, P. Kamath, V. Arbab, M. Hagi, A. Willner, J. Bannister, J. Touch, “[Experimental Demonstration of Interference Avoidance Protocol \(Transmission Scheduling\) for O-CDMA Networks](#),” *Optics Express Journal*, V15 N25, pp. 16442-16447, Dec. 2007.

N. Fujita, J. Touch, V. Pingali, Y. Wang, “[A Dynamic Topology and Routing Management Strategy for Virtual IP Networks](#),” *IEICE Trans. on Communications*, VE89-B, N9, Sept. 2006, pp. 2375-2384.

K. Merchant, J. McGeehan, A. Willner, S. Ovadia, P. Kamath, J. Touch, J. Bannister, “[Analysis of an Optical Burst Switching Router with Tunable Multiwavelength Recirculating Buffers](#),” *IEEE/OSA Journal of Lightwave Technology*, V23, N10, Oct. 2005, pp. 3302-3312.

M. Hauer, J. McGeehan, S. Kumar, J. Touch, J. Bannister, E. Lyons, C. Lin, A. Lau, H. Lee, D. Starodubov, & A. Willner, “[Optically-Assisted Internet Routing Using Arrays of Novel Dynamically Reconfigurable FBG-Based Correlators](#),” *IEEE/OSA Journal of Lightwave Technology*, Special Issue on Optical Networks, V21 N11, Dec. 2003, pp. 2765-2778.

J. McGeehan, S. Kumar, D. Gurkan, S. Motaghian Nezam, J. Bannister, J. Touch, & A. Willner “[All-Optical Decrementing of a Packet’s Time-To-Live \(TTL\) Field and Subsequent Dropping of a Zero-TTL Packet](#),” *IEEE/OSA Journal of Lightwave Technology*, Special Issue on Optical Networks, V21 N11, Dec. 2003, pp. 2746-2752.

J. Touch, “Those Pesky NATs,” *IEEE Internet Computing*, July/Aug. 2002, pp. 96. Original version in [PDF](#); a cached copy of the extended online version is available in [HTML](#) or [PDF](#).

J. Touch, “[Dynamic Internet Overlay Deployment and Management Using the X-Bone](#),” *Computer Networks*, July 2001, pp. 117-135. A [previous version](#) appeared in Proc. ICNP 2000, pp. 59-68.

J. Bannister, J. Touch, A. Willner, S. Suryaputra, “[How Many Wavelengths Do We Really Need? A Study of the Performance Limits of Packets over Wavelengths](#)” *Optical Networks*, April 2000, pp. 17-28.

L. Eggert, J. Heidemann, J. Touch, “[Effects of Ensemble TCP](#),” *ACM Computer Communications Review (CCR)*, Jan. 2000, pp. 15-29.

J. Touch and A. S. Hughes, “[The LSAM Proxy Cache - a Multicast Distributed Virtual Cache](#),” *Computer Networks and ISDN Systems*, V30 N22-23, Nov. 25, 1998, pp. 2245-2252.

S. Walton, A. Hutton, and J. Touch, “[High-Speed Data Paths in Host-Based Routers](#),” *IEEE Computer*, Nov. 1998, pp. 46-52. An earlier version appeared at the LANMAN Workshop in 1998.

J. Heidemann, K. Obraczka, J. Touch, “[Modeling the Performance of HTTP Over Several Transport Protocols](#),” *IEEE/ACM Transactions on Networking*, V5, N5, Oct. 1997, pp.616-630.

J. Sterbenz, H. Schulzrinne, J. Touch, “[Report and Discussion on the IEEE ComSoc TCGN Gigabit Networking Workshop 1995](#),” *IEEE Network*, July 1995, pp.9-21.

J. Touch, “[Defining ‘High Speed’ Protocols: Five Challenges & an Example That Survives the Challenges](#),” in *IEEE Journal on Selected Areas of Communications (JSAC)*, Spec. Issue on Applications Enabling Gigabit Networks, Vol. 13, No. 5, June 1995, pp. 828-835.

J. Touch, D. Farber, “[Reducing Latency in Communication](#),” Letter to the editor *IEEE Communications Magazine*, Vol. 31, No. 2, Feb. 1993, pp. 8-9.

J. Touch, "Telecom. Issues of Intelligent Database Mgt. for Ground Proc. Systems in the EOS Era," *Telematics and Informatics*, Vol 11 No. 4, 1994, pp. 319-332.

*Refereed Conferences:*

S. Suryaputra, J. Touch, J. Bannister, "The Case of a Precognition Optical Packet Switch," Proc. IEEE High-Speed Networks Workshop, Apr. 2009.

S. Adachi, Y. Zambre, J. Pulliam, J. Haines, M. Everett, J. Touch, V. Mehta, "Network Management Approach For The TSAT Network," Proc. IEEE Milcom, Oct. 2008.

J. Pulliam, Y. Zambre, A. Karmarkar, V. Mehta, J. Touch, J. Haines, M. Everett, "TSAT Network Architecture," Proc. IEEE Milcom, Oct. 2008.

J. Jacobson, Y. Zambre, J. Pulliam, J. Touch, M. Everett, J. Haines, V. Mehta, "Network Security Architecture and Mechanisms in the TSAT System," Proc. IEEE Milcom, Oct. 2008.

J. Touch, V. Pingali, "The RNA Metaprotocol," Proc. IEEE International Conf. on Computer Comm. (ICCCN), Aug.. 2008.

E. Yang, J. Touch, "Optimal and Deterministic Symmetric Key Assignment for Secure Pair-wise Network Communication," Proc. Int'l Conf. on Networking (ICN), April 2008, Cancun, Mexico.

V. Pingali, J. Touch, "Protecting Public Servers from DDoS Attacks Using Drifting Overlays," Proc. IEEE / IST Workshop on Monitoring, Attack Detection and Mitigation (MonAM), Nov. 2006.

J. Touch, Y. Yang, "Reducing the Impact of DoS Attacks on Endpoint IP Security," Proc. NPSec 2006, in conjunction with ICNP 2006, Nov. 2006.

P. Saghari, P. Kamath, V. Arbab, M. Haghi, A. Willner, J. Bannister, J. Touch, "Experimental Demonstration of an Interference-Avoidance-Based Protocol for O-CDMA Networks," Proc. OFC 2006, Mar. 2006.

P. Kumar, R. Omrani, J. Touch, A. Willner, P. Saghari, "Three-Fold Increase in Number of Active Users in an O-CDMA System Using Novel Code-Cycle Modulation," Proc. OFC 2005, Mar. 2005.

L. Eggert, J. Touch, "IdleTime Scheduling with Preemption Intervals," Proc. Symposium on OS Principles (SOSP) 2005, pp. 249-262.

J. Touch, Y. Wang, V. Pingali, L. Eggert, R. Zhou, G. Finn, "A Global X-Bone for Network Experiments," Proc. IEEE Tridentcom 2005, Trento Italy, Feb. 2005, pp. 194-203.

K. Merchant, J. McGeehan, A. Willner, S. Ovadia, P. Kamath, J. Touch, J. Bannister, "Performance Evaluation of a Router with Tunable Recirculating Buffers in an Optical Burst Switching Environment," Proc. Broadnets 2004, San Jose, CA, Oct. 2004.

P. Kamath, J. D. Touch, J. A. Bannister, "Algorithms for Interference Sensing in Optical CDMA Networks," Proc. IEEE International Conference on Communications (ICC), Paris, June 2004, pp. 1720-1724.

P. Kamath, J. Touch, J. Bannister, "The Need for Media Access Control in Optical CDMA Networks," Proc. Infocom 2004.

J. Touch, V. Pingali, "DataRouter: A Network-Layer Service for Application-Layer Forwarding," Proc. International Workshop on Active Networks (IWAN), Osaka, Springer-Verlag, December 2003.

J. Touch, G. Finn, Y. Wang, L. Eggert, "DynaBone: Dynamic Defense Using Multi-layer Internet Overlays," Proc. 3rd DARPA Information Survivability Conference and Exposition (DISCEX-III), Washington, DC, USA, April 22-24, 2003, Vol. 2, pp. 271-276.

- J. Touch, L. Eggert, Y. Wang, "[TetherNet Anti-NAT - Secure Internet Subnet Rental System](#)," Proc. 3rd DARPA Information Survivability Conference and Exposition (DISCEX-III), Washington, DC, USA, April 22-24, 2003, Vol. 2, pp. 112-114.
- D. Gurkan, S. Kumar, A. Sahin, A. Willner, K. Parameswaran, M. Fejer, D. Starodubov, J. Bannister, P. Kamath, J. Touch, "[All-Optical Wavelength and Time 2-D Code Converter for Dynamically-Reconfigurable OCDMA Networks Using a PPLN Waveguide](#)," Proc. Optical Fiber Communication Conference (OFC), Atlanta, Mar. 23-28, 2003, pp. 9-11.
- J. McGeehan, S. Kumar, A. Willner, J. Bannister, J. Touch, "[Optical Time-to-Live Decrementing and Subsequent Dropping of an Optical Packet](#)," Proc. Optical Fiber Communication Conference (OFC), Atlanta, Mar. 23-28, 2003, pp. 8-10.
- P. Kamath, K. C. Lan, J. Heidemann, J. Touch, J. Bannister, "[Generation of High-Bandwidth Traffic Traces](#)," Proc. MASCOTS, 10th International Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems, Texas, Oct. 2002.
- Y. Wang, J. Touch, "[Application Deployment in Virtual Networks Using the X-Bone](#)," Proc. DANCE: DARPA Active Networks Conference & Exposition, IEEE Computer Society Press, May 2002, pp. 484-493.
- M. Hauer, J. McGeehan, J. Touch, P. Kamath, J. Bannister, E. Lyons, C. Lin, A. Au, H. Lee, D. Starodubov, and A. Willner, "[Dynamically Reconfigurable All-Optical Correlators to Support Ultra-fast Internet Routing](#)," Proc. Optical Fiber Communications Conference (OFC), March 2002.
- J. Bannister, J. Touch, P. Kamath, A. Patel, "[An Optical Booster for Internet Routers](#)," Invited Paper, *Proc. Eighth International Conference on High Performance Computing*, Hyderabad, India, Dec. 2001, pp. 339-413.
- O. Ardaiz Villanueva, J. Touch, "[Web Service Deployment Using the X-Bone](#)," *Proc. SEID 2000*.
- S. Suryaputra, J. Touch, J. Bannister, "[Simple Wavelength Assignment Protocol](#)," in *Terabit Optical Networking: Architecture, Control, and Management Issues*, John M. Senior, Sudhir Dixit, Chunming Qiao, Editors, Proceeding of SPIE Vol. 4213, pp. 220-233 (2000) (Proc. Photonics East). A [previous version](#) appeared as an ISI Technical report, TR-99-473, October 1999.
- J. Bannister, J. Touch, A. Willner, S. Suryaputra, "[How Many Wavelengths Do We Really Need in an Internet Optical Backbone?](#)" in *Protocols for High-Speed Networks VI*, eds. J. Touch and J. Sterbenz, Kluwer, 1999.
- A. S. Hughes and J. Touch, "[Cross-Domain Cache Cooperation for Small Clients](#)," in *Proc. Network Storage Symposium (NetStore) 1999*, Seattle, WA.
- G. Finn, J. Touch, "[The Personal Node](#)," in *Proc. USENIX '99 Workshop on Embedded Systems*, 1999, pp. 1-7.
- T. Faber, J. Touch, and W. Yue, "[The TIME-WAIT state in TCP and Its Effect on Busy Servers](#)," in *Proc. IEEE Infocom*, 1999, pp. 1573-1583.
- J. Touch, S. Hotz, "[The X-Bone](#)," in *Proc. Third Global Internet Mini-Conference*, Proc. Globecom '98, Sydney, Australia Nov. 1998.
- S. Walton, A. Hutton, J. Touch, "[High Performance IP Forwarding Using Host Interface Peering](#)," (extended abstract) in *Proc. 9th IEEE Workshop on Local and Metropolitan Area Networks (LANMAN)*, Banff, Alberta, Canada, May 17-20, 1998
- J. Touch, T. Faber, "[Dynamic Host Routing for Production Use of Developmental Networks](#)," in *Proc. ICNP '97*, Atlanta, Oct. 1997, pp. 285-292.

B. Kwan, P. Hu, N. Bambos, L. Kleinrock, J. Touch, H. Xu, “[Best-Effort Bandwidth Reservation in High Speed LANs using Wormhole Routing](#),” in *Proc. Int’l. Conf. on Comp. Comm. & Networks ’96*, Wash. D.C.

J. Touch, “[Performance Analysis of MD5](#),” in *Proc. ACM Sigcomm ’95*, pp. 77-86.

J. Touch, “[Protocol Parallelization](#),” in *Protocols for High Speed Networks IV*, Ed. G. Neufeld and M. Ito, Chapman and Hall, London, 1995, pp. 349-360.

J. Touch, D. Farber, “[An Experiment in Latency Reduction](#),” in *Proc. IEEE Infocom*, June 1994, pp. 175-181.

J. Touch, “[Parallel Communication](#),” in *Proc. IEEE Infocom*, Mar. 1993, pp. 506-512.

J. Touch, “[Physics Analogs in Communications Models](#),” in *Proc. Workshop on Physics and Computation, Physcomp ’92*, Oct. 1992, pp. 248-252.

J. Touch, D. Farber, “[Mirage: A Model for Ultra High-Speed Protocol Analysis and Design](#),” in *Protocols for High-Speed Networks*, Ed. J. Rudin and R. Williamson, North-Holland, Amsterdam, 1989, pp. 115-133.

K. Birman, J. Touch, “[An Experimental ECG Scanning System](#),” (extended abstract) in *Proc. of the Ninth Annual Conf. of the IEEE Engineering in Medicine and Biology*, Boston, Nov. 13-16, 1987.

J. Touch, “[Experiments in Flat-Glass Cutting Optimization](#),” in *Proc. Symposium on the Complexity of Approximately Solved Problems*, at Columbia University, NY, Apr. 1985.

#### *Other Conferences:*

V. Pingali, J. Touch, “[Dynamic Network Renaming using Space-Time Contexts](#),” (extended abstract and poster), *Proc. Infocom 2007 Student Poster Session*, May 2007

J. Touch, “[Recursive Network Architecture](#),” *IEEE Workshop on Computer Communications (CCW)*, Pittsburgh PA, Feb. 2007.

Y. Wang, J. Touch, J. Sylvester, “[Poster: Adding Selection into Protocol Stacks – Communication with Choices](#),” (extended abstract and poster), *Proc. ICNP 2006 Student Poster Session*, Nov. 2006.

P. V. Kumar, R. Omrani, J. Touch, A. Willner, P. Saghari, “A Novel Optical CDMA Modulation Scheme: Code Cycle Modulation,” *Proc. Globecom 2006, Comm. Theory Symposium*, Oct. 2006.

J. Touch, “[OCS: An Open Communicating System](#),” *IEEE Workshop on Computer Communications (CCW)*, Irvine, CA, Oct. 2005.

J. Touch, “[The Need for a ‘Communicating System’](#),” (white paper), *NSF Workshop on Grand Challenges in Distributed Systems*, Cambridge, MA, Sept. 29-30, 2005.

J. Touch, Y. Wang, . Pingali, L. Eggert, R. Zhou, G. Finn, “[A Global X-Bone for Network Experiments](#),” (extended abstract), *Proc. Infocom 2005 Student Poster Session*, Mar. 2005.

P. Kamath, J. Touch, J. Bannister, “[Interference Avoidance in Optical CDMA Networks](#),” (extended abstract), *Proc. Infocom 2005 Student Workshop*, Mar. 2005.

J. Touch, “[An Optically Turbocharged Internet Router](#),” *IEEE Workshop on Computer Communications (CCW)*, Charlottesville, VA, Oct. 2001.

J. Touch, Y. Wang, L. Eggert, G. Finn, “[Virtual Internet Architecture](#),” *Future Developments of Network Architectures (FDNA) at Sigcomm*, August 2003. Available as [ISI-TR-2003-570](#).

A.S. Hughes, J. Touch, “[Cross-Domain Cache Cooperation for Small Clients](#),” *Network Storage Symposium (NetStore 99)*, Seattle WA, 1999.

- J. Bannister, S. Suryaputra, J. Touch, A. Willner, “[How Many Wavelengths Do We Really Need in an Optical Backbone Network?](#)” IEEE Gigabit Networking Workshop, NYC, 1999.
- S. Walton, A. Hutton, and J. Touch, “[High Performance IP Forwarding Using Host Interface Peering](#),” (extended abstract) Proc. 9th IEEE Workshop on Local and Metropolitan Area Networks (LANMAN), Banff, Alberta, Canada, May 17-20, 1998 (slides also available).
- J. Touch, J. Bannister, A. Willner, “[Smart WDM IP Flow Technology \(SWIFT\)](#),” (slides only), IEEE Gigabit Networking Workshop, San Francisco, 1998.
- J. Touch, A. Hutton, S. Walton, “[Host-based Routing Using Peer DMA](#),” (slides only), IEEE Gigabit Networking Workshop, San Francisco, 1998.
- J. Touch, “[Community-of-Interest Driven Multicast Preloading of Web Caches](#),” IEEE Workshop on Computer Communications, Phoenix AZ, Sept. 1997.
- J. Touch, K. Obraczka, A. Hughes, A. Oswal. “[Proactive Web Caches](#),” NLANR Web Cache Workshop, Boulder CO, June 1997. See also [white paper submission](#).
- J. Touch, “[The X-Bone](#),” (white paper), NSF Workshop on Research Directions for the Next-Generation Internet, Vienna, VA, May 13-14, 1997.
- J. Touch, T. Faber, A. Hutton, D. Jani, W. Yue, “[Experiences with a Production Gigabit LAN](#),” (slides only), IEEE Gigabit Networking Workshop, Kobe, Japan, 1997.
- J. Touch, “[Web Transport Requirements](#),” presented at the Web Transport BOF at IETF '96, March, Los Angeles.
- J. Touch, T. Faber, A. DeSchon, A. Sachdev, “[ATOMIC-2: Going the Last Meter for Gigabit LANs](#),” (slides and abstract only), IEEE Gigabit Networking Workshop, San Francisco, CA, 1996.
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### *Technical Reports:*

J. Bannister, W.-M. Shen, J. Touch, F. Hou, V. Pingali, "[Applied Learning Networks](#)," ISI Technical Report ISI-TR-2007-637, Apr. 2007.

J. Touch, Y. Wang, V. Pingali, "[A Recursive Network Architecture](#)," ISI Technical Report ISI-TR-2006-626, Oct. 2006.

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Y. Wang, J. Touch, J. Silvester, "[A Unified Model for End Point Resolution and Domain Conversion for Multi-Hop, Multi-Layer Communication](#)," ISI Tech. Report ISI-TR-2004-590, June 2004.

J. Touch, "[SIGCOMM Treasurer's Report](#)," ACM Computer Communications Review, Nov. 2003.

J. Train, J. Touch, L. Eggert, Y. Wang, "[NetFS: Networking through the File System](#)," ISI Tech. Report ISI-TR-2003-575.

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Lars Eggert and Joe Touch, "[End-System Support for Idle-Time Networking](#)," ISI Technical Report ISI-TR-559, May 14, 2001.

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- J. Touch, "[Board for Realizing Active Intelligence in Networks \(BRAIN\)](#)," ISI Research Report ISI/RR-98-462, July 1998 (original report dated May 1997).
- J. Touch, "[Multicast web push using interest-groups: the LSAM Proxy Cache \(LPC\)](#)," IPMI Member Newsletter, Aug. 1998, pp. 2-6.
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- C. Partridge, Ed., (as member of authoring committee), "[Report of the ARPA/NSF Workshop on Research in Gigabit Networking](#)," Washington DC, July 20-21, 1994.
- J. Touch, "[Zoned Analog Personal Teleconferencing \(ZAPT\)](#)," ISI Special Report ISI/SR-94-374, Feb. 1994.
- J. Touch, "[Mirage: A Model for Latency in Communication - A Proposal for Dissertation Research](#)," U. Penn. Dept. of Computer & Info. Science (CIS) Technical Report MS-CIS-90-74, DSL-3, Oct. 1990.
- J. Touch, D. Farber, "[Replication and Reduction in Multistage Interconnection Networks](#)," Univ. of Penn. Dept. of Computer & Info. Science (CIS) Technical Report MS-CIS-89-80, DSL-2, Dec. 1989.

*Invited Panels, Talks, Tutorials:*

- Presentation on "Recursive Network Architecture" in the plenary panel on "Clean Slate Architectures" at Infocom, April 2009, Rio de Janeiro.
- "Recursive Network Architecture" at Network Achitecture, Ascona, Switzerland, March 2009.
- "The X-Bone & its Virtual Internet Architecture - 10 Years Later" (presented by Lars Eggert), Workshop on Overlay and Network Virtualization, Kassel, Germany, March 2009.
- "X-Bone + 10: A Decade of International Collaboration" at the NSF US-Japan Collaboration Workshop, Palo Alto, CA Oct. 2008.
- "One Packet Only" and Other Curiosities: Alternate Axioms that Shake Up the Hourglass," with J. Day at IEEE Workshop on Computer Communications (CCW), Steamboat Springs, CO, Oct. 2008.
- "The Paper Chase," at "How to Write a Good Paper" panel at IEEE Infocom 2006 Student Workshop, April 24, 2006.
- "Getting OUT of Grad School," at "Job Hunting Around the World: Prospects Tips, and Other Advice" panel at IEEE Infocom 2005 Student Workshop, Mar. 14, 2005.
- "Virtual and Overlay Networks," ICNP Tutorial, Berlin, Germany, Oct. 2004; Infocom Tutorial, Miami, Mar. 2005.
- "[Internet Bill of Rights](#)," Preventing the Internet Meltdown Conf., Westchester, CA, July 27, 2004.
- "Optical Internet Router," CENIC, Los Angeles, March 16, 2004; Internet-2, Columbus, OH, July 20, 2004.
- "Internet & Politics," USC Annenberg TV News television spot, Nov. 3, 2003.
- "Network Trust Issues," NSF ANIR Network Trustworthiness panel, Jan. 9-10, 2003.
- "9/11 Online," "9/11 Remembrances," KTLA 'Kurt the Cyberguy' interviews, Sept. 9 & 11, 2002.

“Peer Networks – High Speed Solution or Challenge?” Protocols for High-Speed Networks, Berlin, Germany, Apr. 2002.

“TetherNet & Postel Center,” CENIC, San Diego, May 10, 2001.

“Peer-to-Peer Overlays: Active Network Prospect or Challenger?” OpenArch 2001, Anchorage, AK, Apr. 2001.

“End2End Argument vs. Programming the Internet: Are the Two Complementary?” Opensig 2000, Napa, CA, Oct. 2000.

“X-Bone demo,” EDUCAUSE/CENIC, Long Beach, CA, Oct. 26, 1999.

“10 Years of PfHSN - where have we been, where are we going?” IFIP Protocols for High-Speed Networks 1999, Salem, MA, Aug. 1999.

“Summary Report on the Optical Internet Workshop,” 40<sup>th</sup> IETF (plenary), Wash., D.C., Dec. 1997.

“Community-of-Interest Driven Multicast Preloading of Web Caches,” in *Proc. IEEE Workshop on Computer Communications (CCW)*, Phoenix AZ, Sept. 1997.

“High-Performance Web,” IFIP Protocols for High-Speed Networks 1996, Sophia-Antipolis, France, Oct. 1996.

“High Level Communications,” ACM Sigcomm 1995 Middleware Workshop, Boston MA, Aug. 1995.

#### *Pending publications*

V. Pingali, “Recursive Temporal Namespaces,” (submitted).

J. Touch, A. Mankin, R. Bonica, “[A TCP Authentication Option](#),” (RFC in progress), July 2008.

M. Cotton, L. Eggert, A. Mankin, M. Westerlund, J. Touch, “[IANA Procedures for the Transport Protocol Port Number Space](#),” (IETF TSVWG RFC in progress), July 2008.

J. Touch, M. Mathis, “[IPv4 ID Uniqueness Requirements](#),” (RFC in progress), July 2008.

J. Touch, M. Townsley, “[Tunnels in the Internet Architecture](#),” (RFC in progress), July 2008.

J. Touch, “[A TCP Option for Port Names](#),” (RFC in progress), Apr. 2006.

V. Pingali, J. Touch, “Addressing Uncertainty during Renaming using Space-time Contexts,” under submission.

P. Kamath, J. Touch, J. Bannister, “Transmission Scheduling in Optical CDMA Networks,” (submitted).

Y. Wang, J. Touch, “A Unified Model for Endpoint Resolution and Domain Conversion for Multihop, Multilayer Communication,” (submitted).

J. Train, J. Touch, L. Eggert, Y. Wang, “[NetFS: Networking through the File System](#),” (submitted).

A.S. Hughes, J. Touch, J. Heidemann, “Issues in TCP Slow-Start Restart After Idle,” (RFC in progress).

## Ph.D. Students

Amy S. Hughes, “Enhancing Network Object Caches through Cross-Domain Cooperation,” Oct. 2002, USC CS (chair).

Lars René Eggert, “Background Use of Idle Resource Capacity,” Oct. 2003, USC CS (chair).

Puroshutham Kamath, “Media Access Control Protocols for Optical CDMA Networks,” May 2006, USC EE (co-chair w/Joseph Bannister).

Yu-Shun Wang, “A Unified Model for Endpoint Resolution and Domain Conversion for Multi-hop, Multi-layer Communication,” Dec. 2006, USC CE (co-chair w/John Silvester).

Venkata Pingali, “Addressing Uncertainty during Renaming using Space-time Contexts,” Jan. 2009, USC CS (chair).

## Areas of Research/Key Contributions and collaborators (\*=active)

### *Network Architecture*

- \*Automation and abstractions for network management (Instant Infrastructure, TetherNet, Turnkey Nets)
- \*Application header options to support network layer peer services (DataRouter)
- \*Multilayer virtual nets to resist distributed denial-of-service attacks (DynaBone) (Eggert, Wang)
- \*Virtual nets via 2-layer tunneling for dynamic routing, IPsec, revisitation (X-Bone, DynaBone, Agile Tunnels) (UCL, UMU, KAME)
- \*Network control API as a file system (NetFS) (Eggert, Wang)
- \*Geographic networks (GONet) (Finn)
- IPsec transport and tunnel mode interactions (Eggert, Wang, Kent, Hagino)
- Application deployment on virtual overlay networks (Wang, Ardaiz)
- Architecture for smart spaces (Personal Node) (Finn)
- Implications of link protocol capabilities on support for Internet protocols (Kam)
- Protocols for optical cut-through switching (Bannister, Suryaputra)
- Configuring end hosts for fault-tolerant routing (Faber)

### *TCP Performance:*

- \*Configurations for high-performance (Faber)
- \*Slow-start restart avoidance mechanism (Hughes, Floyd)
- \*Connection multiplexing issues (BXXP/BEEP, HTTP) (Heidemann, Eggert)
- Control block sharing to coordinate parallel connections (Eggert)
- Avoiding TIME-WAIT (Faber)

### *Network Hardware:*

- \*Optical router design (Bannister, Kamath, Patel, Hauer, McGeehan)
- Peer DMA for high-speed host-based routers (Hutton)
- IP checksum hardware implementation (Parham)
- Performance limits of MD5 authentication hash
- Network interface design (LaCoss)

### *Web Caching:*

- Inter-application sharing for advanced prefetching (Hughes)
- Self-organizing cache hierarchies (Hotz, Hughes)
- Web performance over TCP (Eggert, Heidemann, Obraczka)
- Multicast for self-tuning content delivery networks for flash crowd traffic (Hotz, Hughes)

### *Community Service:*

- \*Maintain end2end-interest, internet-history, optical-internet email lists
- \*Developed a tethered tunnel system to simplify DARPA demos (TetherNet) (Wang)
- Codify email and technical sponsorship procedures for IEEE TCGN and ITC technical committees
- Codify budget procedures for ACM Sigcomm conference planning
- Codify paper submission, plagiarism, and republication policies for EDAS

### *ISI Service:*

- \*Coordinate/maintain the shared Network and Postel Center Labs (X-Bone group)
- \*Maintain bagel breakfast web pages, holiday ornament web pages, organize holiday ornaments
- \*USC Ambassador