Joseph D. Touch, Ph.D.

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www.strayalpha.com (includes this CV and an extended CV)

Education

PhD. Computer and Information Science, Univ. of Pennsylvania, 1992, advisor: David J. Farber.

M.S. Computer Science, Cornell Univ., 1987.

B.S. Biophysics and Computer Science, Univ. of Scranton, 1985 (*summa cum laude* with Honors).

Experience

Expert in Internet protocols, network architecture, distributed systems architecture, network virtualization, high-speed networking, network security, quantum nets, optical computing, and optical networking.

The Aerospace Corporation (Aug. 2017-present)

Principal Scientist (Feb. 2021-present);
previously **Sr. Distributed Systems Data Architect** (Aug 2017-Feb. 2021)

Supporting the front office of the Engineering and Technology Group (ETG) Information Systems and Cyber Division (ISCD) by participating in and advising projects throughout the Aerospace portfolio on networking and distributed systems architecture, including protocols, cloud systems, hardware interfaces, and software services. Leads and supports the development of proliferated LEO hosted constellations, space backbone network architectures, satellite networking programs, cloud and ground systems, and quantum communications.

USC / Information Sciences Institute (June 1992-Aug. 2017)

Postel Center Director (Oct. 2000 – Aug. 2017);
previously **Project Leader** (Oct. 1995 – Sep. 2000) and **Research Scientist** (Jun. 1992 – Oct. 1995)

Developed Internet link, network, application, and operating systems concepts for virtual networking, optical nets, high-speed networking, latency reduction, and high-performance network security. Designed/implemented the architecture of large software systems, explored fine-grained network configuration control, DDOS protection, learning-based performance tuning, and embedded personal Internet devices. Designed and implemented hardware for components of an all-optical Internet router, a high-speed LAN network interface, and devices for high-performance checksums.

Active participant in Internet standards (IETF); link (PILC, INT, TRILL, SHIM6), network (IP, L3VPN), security (IPSEC, BTNS, KARP), transport (TCPM, TSVWG, PMTUD) working groups.

Research Associate Professor (CS Associate Prof. Jun. 2002 – Aug. 2017,
EE joint appointment Jun. 2003 – Aug. 2017, CS Assistant Prof. Feb. 1994 – Jun. 2002)

Advised Ph.D. and M.S. students, teaches graduate classes on networking and distibuted systems. Developed the "First Principles Approach to Computer Networking" course (2015-2017). Developed the Summer Graduate Research Experience Program (SGREP) at ISI (1999-2004).

US Air Force Space Missile Center (SMC) (October 2006-2010, IPA "on-loan")

Senior Network Engineer and **Network Chief**

Advised the Transformational Communications Satellite (TSAT) Program Office and Advanced Concepts Group to coordinate the network aspects of two risk-reduction communications satellite development contracts and a ground network management contract. Advised the USAF on technical risks, provided technical background, and helped review contractor performance.

Technical Leadership and Management

Human Communication in a Connected World (NSF REU Site, 2017-2020)
 Undergraduate projects in communications, cybersecurity, big data, and social networking.
Optical Turing Machine (NSF, 2012-2017)
 Developing a new science of multibit symbol all-optical computation from first principles.
CIAN (NSF, 2008-2015)
 Co-leader of Working Group 2, coordinating design of an optical aggregation node and network.
DynaSat dynamic satellite networking (DARPA, 2011)
 Lead 5 FTE design of network protocol, OS, and file system for a SOA cluster satellite system.
RNA recursive network architecture (NSF, 2006-2012)
 Lead a team of students to develop an Internet architecture that natively supports overlays and recursion, collab. with teams in Europe and Asia on its future Internet architecture implications.
X-Bone overlay deployment system (Linux RPM, FreeBSD & Cisco) (DARPA, NSF, NSA, 1998-2006)
 Led a 19-member (~4-6.5 FTE) team to develop a SOA-based Internet overlay (VPN) deployment system. Includes 13 public software releases in 2000-2006 (15,000 lines Perl). The software passed "Red Team" security analysis by Sandia National Laboratories. The system pioneered virtual network extensions to the Internet and is used at several universities and labs, and is the basis for the EU 6Net testbed. Also resulted in patches to FreeBSD, MacOS/X, and Linux OSes.
Tethernet Internet subnet rental system (stand-alone turnkey router) (DARPA, 2001-2004)
 Led a 3-member (~2 FTE) team to develop a commercial-grade Internet subnet rental system (4,300 lines Perl). Deployed at over a dozen DARPA and NSF meetings, supporting hundreds of demos, and provided Internet support to IEEE, ACM, DARPA, and IFIP conferences.
LSAM multicast web push system (Linux RPM, FreeBSD port) (DARPA, 1996-1999)
 Led a 17-member (~5 FTE) team to develop a self-configuring SOA-based multicast web push system. Publicly released 4 system versions (5,000 lines C) and a separate push-only variant (2,000 lines Perl and C). Resulted in patches to the Apache web server.
PC-ATOMIC high-speed network interface card (DARPA, 1994-1995)
 Led a 7-member (~4 FTE) team to develop a VL-bus PC network interface card for a 640-Mbps LAN. Designed host-based and on-board CPU control with DMA with the first gigabit-per-second IP checksum, used by several universities for DARPA research. Resulted in code in Cisco's IOS.

Professional Activities

ACM Distinguished Scientist, IEEE and OSA Distinguished Lecturer/Senior member, Sigma Xi.

Director/chair/committee members in ACM SIGCOMM, IEEE Communications Society, OSA

Editorial boards: Elsevier's Computer Networks (and ISDN Systems, formerly) 1999-2006, Elsevier Journal of Computer and Systems Sciences 2007-2015, IEEE Network 1997-2012

IANA Port Experts review team leader 2008-present, IETF Transport Area Directorate 2008-present

Sigma Xi membership reviewer 2015-present

Publication Summary

Total patents: 5	*Books/chapters/tutorials:* 14	*Special issues:* 6
Total journal papers: 44	*Total conference papers:* 90	*Internet RFCs:* 21

Research Summary

Link layers (2000-): link and satellite impact on Internet design, bridge aggregation
Optical networks (1998-): optical router, optical IP router, digital optical devices, MAC/link issues
Overlays (1998-): X-Bone Internet overlay architecture, DynaBone multilayer VPNs for fault tolerance
TCP/IP (1995-): TCP shared control performance, string-based IP forwarding, server performance
Internet security (1995-): MD5 speed, authetication-free security, TCP authentication, fast security
Web (1997-2002): HTTP performance, multicast web push
High-speed nets (1992-1998): Fast host router design, protocol parallization, web/file push