Brian Trammell

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Summary

Internet measurement, security, and architecture expert aiming to apply my experience in engineering management, systems architecture, research, and standardization to the improvement of the Internet.

Birthdate	11 July 1977
Citizenship	Switzerland, United States of America
Languages	English native speaker, German level C1, basic Swiss German

Professional Experience

Mar. 2019 – present   **Site Reliability Manager**, Borg SRE
Google Switzerland GmbH, Zürich

Manage a Site Reliability Engineering (SRE) team responsible for Borg, Google's cluster operating system. Manage the design, development, and operation of aspects of the Borg ecosystem. Contribute to the design, engineering and operations of Borg through software architecture, software development, and oncall rotation work. Mentor new members of the team and assist in professional and career development of the team.

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Mar. 2014 – Mar. 2020   **Member** of the **Internet Architecture Board** (IAB)

Provide architectural guidance to the Internet Engineering Task Force (IETF) and the Internet community at large. Oversee the activities of the IETF. Led the IAB's IP Stack Evolution Program on the deployment of new end-to-end transports and services in the Internet. Member of the IAB's Privacy and Security and Technical Plenary Planning Programs. Position appointed by the IETF Nominations Committee (NomCom), appointment renewed every two years.

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June 2010 – Jan. 2019   **Senior Researcher**, Networked Systems Group
(formerly Communication Systems Group)
Eidgenössische Technische Hochschule, Zürich

Conducted Internet measurement research, focused on applications for performance, protocol stack evolution, and network security. Led ETH participation in related international research consortia, including: proposal co-coordinator and measurement lead of the European Commission H2020 Measurement and Architecture for a Middleboxed Internet (MAMI) project; architect of the EC Seventh Framework (FP7) mPlane research project on building iterative passive and active measurement infrastructures from heterogeneous components; measurement lead of FP7 DEMONS project on interdomain cooperation in security monitoring. Supervised students in thesis projects related to network measurement. Managed a research-oriented, long-term network traffic data collection and storage system covering a national-scale research and education network. Concurrent appointment as Architecture Evangelist at the Network Security Group, Department of Computer Science, ETH Zürich.

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June 2008 – May 2010   **Researcher**, Secure Systems Laboratory
Hitachi Europe, Zürich

Conducted research on privacy-preserving network measurement as part of the EC FP7 PRISM[1] research project. Supervised integration of the integrated trial of the PRISM platform. Consulted internally on privacy and data protection aspects of Hitachi product development.

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[1] no, not that PRISM.

Aug. 2002 – May 2008   **Technical Lead, Engineering,** Network Situational Awareness
Software Engineering Institute, Carnegie Mellon University, Pittsburgh

Managed a team of software engineers in the design, implementation, deployment, and maintenance of software systems for the large-scale passive network traffic monitoring for network security operations and research purposes. Managed the development of tools according to varying functional and technical requirements from SEI's sponsors. Supported the deployment and operation of these tools within international-scale enterprise networks. Developed the YAF flow meter, and managed the development of the SiLK analysis tools.

Jan. 2002 – Dec. 2003   **Managing Partner**
Leapfrog Research and Development LLC, Pittsburgh

Founded a software engineering consulting firm with a focus on early-stage projects for small clients. Projects included embedded software development for power systems and industrial control planning systems.

Feb. – Oct. 2001   **Software Enginee**r
PanGo Networks, Inc., Pittsburgh

Designed and implemented tools for the data collection and analysis for a platform for location determination based on WiFi signal strength. Awarded US Patent 7,346,359 "Method for RF Fingerprinting" for this work.

May 2000 – Feb. 2001   **Software Engineer**
iVentureLab, Inc., Pittsburgh

Developed software at an Internet startup incubator, including a scalable web crawler for privacy policy verification.

Dec. 1996 – May 2000   **System Administrator,** School of Civil and Environmental Engineering
Georgia Institute of Technology, Atlanta

Supported a heterogenous UNIX environment with about four hundred users and fifty hosts running Solaris, Linux, BSD, IRIX, and AIX. Designed and implemented policies and tools for system management in this environment.

Aug. 1993 – Oct. 1996   **Software Developer** and **Quality Assurance Technician**
CADnet Corporation, Atlanta

Implemented drivers for a plot management product, ported components of this product to the Macintosh platform, and assisted technical support in prerelease testing of the platform, as part of a recurring summer and part-time position during high school and the first year of university.

Education

Sep. 1995 – May 2000   **Bachelor of Science** in **Computer Science**
Georgia Institute of Technology, Atlanta

Graduated with highest honor (final grade 3.64/4.00). Major area of specialization in computer networking, minor specializations in database design and human-computer interaction. Significant coursework in computer architecture and digital logic design. Member of the Collaborative Software Laboratory (CSL); designed and implemented a distributed network service testing framework at the CSL to test the scalability of the lab's collaborative multimedia learning technologies as a final bachelor thesis.

Selected Publications

Author of twenty-eight conference/workshop papers, ten journal articles, and two book chapters, including:

- De Vaere, P., Bühler, T., Kühlewind, M, and Trammell, B.,
  Three Bits Suffice: Efficient Support for Passive Two-Way Latency Measurement in QUIC and TCP, proceedings of the ACM Internet Measurement Conference (IMC), October 2018.
- Trammell. B, Smith, J.P., and Perrig, A.,
  Adding Path Awareness to the Internet Architecture, IEEE Internet Computing magazine, vol. 22, no.2, March 2018.
- Trammell, B. and Kühlewind, M.,
  Revisiting the Privacy Implications of Two-Way Latency Data, in Proceedings of the 2018 Passive and Active Measurement Conference (PAM), March 2018.
- Kühlewind, M., Bühler, T., Trammell, B., Müntener, R., Neuhaus, S., and Fairhurst, G.,
  A Path Layer for the Internet: Enabling Network Operations on Encrypted Protocols, in Proceedings of the IEEE Conference on Network and Service Management (CNSM), Tokyo, November 2017.
- Bajpai, V., Kühlewind, M., Ott, J., Schönwälder, J., Sperotto, A., and Trammell, B.,
  Challenges with Reproducibility, in Proceedings of the ACM SIGCOMM 2017 Reproducibility Workshop, Los Angeles, 21 August 2017.
- Trammell, B., Perkins, C., and Kühlewind, M.,
  Post Sockets: Towards an Evolvable Network Transport Interface, in Proceedings of the First IFIP/IEEE Networking Workshop on Future Internet Transport (FIT), Stockholm, 12 June 2017.
- Perrig, A. et al, two chapters in **SCION: A Secure Internet Architecture**
  on Isolation Domains (Ch. 3) and Name Resolution (Ch. 6), Springer Verlag, 2017.
- Allman, M., Beverly, R., and Trammell, B.,
  Principles for Measurability in Protocol Design, in ACM Computer Communication Review, vol. 47, no. 2, April 2017. <u>Awarded Best of CCR 2017</u>.
- Trammell, B., Kühlewind, M., Boppart, D., Learmonth, I. Fairhurst, G., and Scheffenegger, R.,
  Enabling Internet-Wide Deployment of Explicit Congestion Notification, in Proceedings of the 2015 Passive and Active Measurement Conference (LNCS 8995). New York, March 2015.
- Hofstede, R., Celeda, P., Trammell, B., Drago, I., Sadre, R., Sperotto, A., and Pras, A.,
  Flow Monitoring Explained: From Packet Capture to Data Analysis with NetFlow and IPFIX, in IEEE Communications Surveys and Tutorials, vol. 16, no. 4, October 2014.
- Trammell, B. and Hildebrand, J.,
  Evolving Transport in the Internet, in IEEE Internet Computing magazine, vol. 18, no. 5, September 2014.
- Trammell, B., Gugelmann, D., and Brownlee, N.,
  Inline Data Integrity Signals for Passive Measurement, in Proceedings of the Sixth International Workshop on Traffic Measurement and Analysis (LNCS 8406). London, April 2014.
- Trammell, B., Casas, P., Rossi, D., Bär, A., Ben Houidi, Z., Leontiadis, I., Szemethy, T., and Mellia, M.,
  mPlane: an Intelligent Measurement Plane for the Internet, in IEEE Communications Magazine, vol. 42, no. 5, May 2014.
- Bagnulo, M., Eardley, P., Burbridge, T., Trammell, B., and Winter, R.,
  Standardizing large-scale measurement platforms, in ACM Computer Communication Review, vol. 43, no. 2, April 2013.
- Kühlewind, M., Neuner, S., and Trammell, B.,
  On the state of ECN and TCP Options in the Internet, in Proceedings of the 2013 Passive and Active Measurement Conference (LNCS 7799). Hong Kong, March 2013.
- Trammell, B., Boschi, E., Procissi, G., Callegari, C., Dorfinger, P., and Schatzmann, D.,
  Identifying Skype traffic in a large-scale flow data repository, in Proceedings of the Third International Workshop on Traffic Measurement and Analysis (LNCS 6613). Vienna, April 2011.
- Trammell, B. and Boschi, E.,
  An Introduction to IP Flow Information Export, in IEEE Communications Magazine, v. 39, n. 4, April 2011.

- Trammell, B., Tellenbach, B., Schatzmann, D., and Burkhart, M.,
  Peeling Away Timing Error in NetFlow Data, in Proceedings of the 2011 Passive and Active Measurement Conference (LNCS 6579). Atlanta, March 2011.
- Inacio, C. and Trammell, B.,
  YAF: Yet Another Flowmeter, in Proceedings of the 24th Annual USENIX Large Installations Systems Administration Conference (LISA). San Jose, November 2010.
- Burkhart, M., Schatzmann, D., Trammell, B., Boschi, E., and Plattner, B.,
  The Role of Network Trace Anonymization under Attack, in ACM Computer Communication Review, vol. 40, no. 1, January 2010.
- Frei, S., Schatzmann, D., Plattner, B., and Trammell, B.
  Modeling the Security Ecosystem: The Dynamics of (In)Security, in Proceedings of the Workshop on the Economics of Information Security 2009. London, June 2009.
- Trammell, B. and Gates, C.,
  NAF: The NetSA Aggregated Flow tool suite, in proceedings of the 20th Annual Large Installation Systems Administration Conference (LISA). Washington, December 2006.

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Contributor to an European Telecommunications Standards Institute (ETSI) Guide on IP network performance measurement (STQ **EG 202 765-3**).

Author or co-author of twenty-one **Requests for Comments (RFCs)** in the **Internet Engineering Task Force (IETF)**: 5101, 5103, 5610, 5655, 6046, 6235, 6546, 6684, 6685, 7011, 7012, 7013, 7015, 7119, 7125, 7373, 7624, 7663, 8095, 8272, 8546. The most important of these concern the IP Flow Information Export (IPFIX) protocol, Internet privacy, and/or the architecture of the Internet transport layer:

- RFC 5103, **Bidirectional Flow Export using IPFIX**
- RFC 5655**, Specification of the IPFIX File Format**
- RFC 6235, **IP Flow Anonymization Support**
- RFC 7011/STD 77, **Specification of the IPFIX Protocol for the Exchange of Flow Information**
- RFC 7013/BCP 184, **Guidelines for Authors and Reviewers of IPFIX Information Elements**
- RFC 7624, **Confidentiality in the Face of Pervasive Surveillance: A Threat Model and Problem Statement**
- RFC 8095, **Services Provided by IETF Transport Protocols and Congestion Control Mechanisms**
- RFC 8546, **The Wire Image of a Network Protocol**

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Speaker on topics related to Internet measurement, architecture, and research, including:

- **Repeatability and Comparability in Measurement,** tutorial at SIGCOMM, 20 August 2018.
- **Science in Perspective: Internet and Trust,** panelist at ETH Zürich, 9 May 2017.
- **Measurement-Driven Protocol Engineering**, technical plenary at IETF 94, Yokohama, 4 November 2015.
- **Platforms and Tools for Internet Measurement: Current and Future Developments**, keynote address at IRTF/ISOC Workshop on Research and Applications of Internet Measurements (RAIM), Yokohama, 31 October 2015.
- **Measuring the Internet by Flows / On Repeatable Internet Measurement**, full day course at University of Zürich IFI Summer School, 27 June 2014
- **Applying IP Flow Information Export (IPFIX) to Network Measurement and Management**, tutorial at RIPE 68, Warsaw, 12 May 2014; at IETF 87, Berlin, 28 July 2013; at ACM Internet Measurement Conference (IMC), Vouliagméni, 22 October 2008.
- **The Open Internet under Threat**, at the University of Auckland, 24 April 2013; at the Internet Society Switzerland chapter, Bern, 27 November 2012.
- **Preparing Regional Internet Registry (RIR) Allocation Data for Network Security Analysis Tasks**, at the North American Network Operators Group (NANOG) 31 meeting, San Francisco, 25 May 2004.

- Co-chair, RIPE Measurement, Analysis, and Tools (MAT) Working Group, October 2017 - present.
- Co-chair, IRTF Path Aware Networking (PANRG) research group, July 2017 - present.

- Co-chair, IETF IP Performance Metrics (IPPM) Working Group, November 2012 - March 2020.
- Co-chair, IETF Bandwidth Aggregation for Network Access (BANANA) BoF sessions, Seoul, November 2016 and Prague, July 2017.
- Co-chair, IETF QUIC BoF session, Berlin, July 2016.
- Co-chair, IRTF How Ossified is the Protocol Stack? (HOPSRG) proposed research group, July 2015 - January 2016.
- Co-chair, IETF Tunneling Compressed Multiplexed Traffic Flows (TCMTF) BoF Session, London, March 2014.
- Co-chair, IETF Managed Incident Lightweight Exchange (MILE) Working Group, November 2011 - March 2014.

- IESG Designated Expert, IANA Service Name and Transport Protocol Port Number Registry, July 2017 - present.
- IESG Designated Expert, IANA IPFIX Information Elements Registry (IE-DOCTORS), Sep 2013 - present .

- Technical Program Committee, Passive and Active Measurement Conference, Eugene, March 2020.
- Technical Program Committee, ACM Internet Measurement Conference, Boston, 31 October-2 November 2018.
- Technical Program Committee, USENIX Workshop on Cybersecurity Experimentation and Test (CSET), Baltimore, 13 August 2018
- Award Committee, IRTF Applied Networking Research Prize 2018.
- Technical Expert Reviewer, European Broadband Mapping Project, May 2016 - December 2017.
- Technical Program Committee, ACM Internet Measurement Conference, London, 1-3 November 2017.
- Technical Program Committee, Network Traffic Measurement and Analysis Conference, Dublin, 21-23 June 2017.
- Technical Program Committee, IEEE/IFIP Workshop on Mobile Network Measurement, Dublin, 20 June 2017.
- Technical Program Committee, IRTF/ACM Applied Networking Research Workshop (ANRW), Berlin, 16 July 2016.
- Technical Program Committee, IRTF/ISOC Research and Applications of Internet Measurement (RAIM) workshop, Yokohama, 31 October 2015.
- Technical Program Committee, IAB Workshop on Managing Radio Networks in an Encrypted World (MaRNEW), Atlanta, September 2015.
- Co-chair, IAB Workshop on Stack Evolution in a Middlebox Internet (SEMI), Zürich, 26-27 January 2015.
- Technical Program Committee, ACM SIGCOMM Capacity Sharing Workshop (CSWS), Chicago, August 2014.
- Technical Program Committee, Posters and Demos, IEEE INFOCOM, Turin, April 2013.
- Technical Program Committee, MetriSec 2012, Lund, Sweden, September 2012.
- Organizing Committee, First ACM Workshop on Network Data Anonymization (NDA), in association with ACM CCS 2008, Alexandria, Virginia, USA, October 2008.

- Honorary Academic, Department of Computer Science, University of Auckland, New Zealand, March 2013-Dec 2015.

- SCinet Network Security and Measurement Teams, Supercomputing 2013, Denver, November 2013.
- SCinet Network Security Team, Supercomputing 2012, Salt Lake City, November 2012.
- SCinet Network Monitoring Team, Supercomputing 2007, Reno, November 2007.