



## John Ousterhout

Leonard Bosack and Sandy K. Lerner Professor of Engineering and Professor of Computer Science, Emeritus

### CONTACT INFORMATION

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### Bio

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#### BIO

John Ousterhout is Professor of Computer Science at Stanford University. His research addresses a wide range of topics related to infrastructure for building software systems, including distributed systems, operating systems, storage systems, development frameworks, and programming languages. His current research is in the area of granular computing: new software stack layers that allow the execution of large numbers of very small tasks (as short as a few microseconds) in a datacenter. His current projects are developing new techniques for thread management, network communication, and logging. Ousterhout's prior positions include 14 years in industry, where he founded two companies (Scriptics and Electric Cloud), preceded by 14 years as Professor of Computer Science at U.C. Berkeley. He is the creator of the Tcl scripting language and is also well known for his work in distributed operating systems and file systems. Ousterhout received a BS degree in Physics from Yale University and a PhD in Computer Science from Carnegie Mellon University. He is a member of the National Academy of Engineering and has received numerous awards, including the ACM Software System Award, the ACM Grace Murray Hopper Award, the National Science Foundation Presidential Young Investigator Award, and the U.C. Berkeley Distinguished Teaching Award.

#### ACADEMIC APPOINTMENTS

- Emeritus Faculty, Acad Council, Computer Science

#### HONORS AND AWARDS

- Distinguished Teaching Award, U.C. Berkeley (1985)
- Grace Murray Hopper Award, ACM (1987)
- Software System Award, ACM (1997)
- Member, National Academy of Engineering (2001)
- Reynold B. Johnson Information Storage Systems Award, IEEE (2014)

#### BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Member, National Academy of Engineering (2013 - present)
- Fellow, Association for Computing Machinery (1980 - present)

- Member, IEEE Computer Society (1980 - present)

## PROFESSIONAL EDUCATION

- PhD, Carnegie Mellon , Computer Science (1980)
- BS, Yale University , Physics (1975)

## PATENTS

- John Ousterhout. "United States Patent 8,042,089 Process Automation System and Method Employing Multi-Stage Report Generation", Electric Cloud, Inc., Oct 18, 2011
- John Ousterhout. "United States Patent 7,886,265 Process Automation System and Method Employing Property Attachment Techniques", Electric Cloud, Inc., Feb 8, 2011
- John Ousterhout. "United States Patent 7,725,524 Process Automation System and Method Having a Hierarchical Architecture With Multiple Tiers", Electric Cloud, Inc., May 25, 2010
- John Ousterhout. "United States Patent 7,676,788 An Architecture and Method for Executing Program Builds", Electric Cloud, Inc., Mar 9, 2010
- John Ousterhout. "United States Patent 7,539,976 A System and Method for Intelligently Distributing Source Files Within a Distributed Program Build Architecture", Electric Cloud, Inc., May 26, 2009
- John Ousterhout. "United States Patent 7,395,529 Conflict Detection and Correction in a Program Build Environment", Electric Cloud, Inc., Jul 1, 2008
- John Ousterhout. "United States Patent 7,168,064 System and Method for Supplementing Program Builds with File Usage Information", Electric Cloud, Inc., Jan 23, 2007
- John Ousterhout. "United States Patent 7,086,063 System and Method for File Caching in a Distributed Program Build Environment", Electric Cloud, Inc., Aug 1, 2006

## LINKS

- My Home Page: <https://web.stanford.edu/~ouster>

## Research & Scholarship

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### CURRENT RESEARCH AND SCHOLARLY INTERESTS

Ousterhout's research ranges across a variety of topics in system software, software development tools, and user interfaces. His current research is in the area of granular computing: new software stack layers that allow the execution of large numbers of very small tasks (as short as a few microseconds) in a datacenter. Current projects are developing new techniques for thread management, network communication, and logging.

## Teaching

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### COURSES

#### 2023-24

- Operating Systems Principles: CS 111 (Spr)
- Software Design Studio: CS 190 (Win)

#### 2022-23

- Operating Systems Principles: CS 111 (Spr)
- Software Design Studio: CS 190 (Win)

### STANFORD ADVISEES

#### Master's Program Advisor

Rehaan Ahmad, June Lee, Mahathi Mangipudi

## Publications

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### PUBLICATIONS

- **Always Measure One Level Deeper** *COMMUNICATIONS OF THE ACM*  
Ousterhout, J.  
2018; 61 (7): 74–83
- **A Philosophy of Software Design**  
Ousterhout, J.  
Yaknyam Press.2018
- **Homa: A Receiver-Driven Low-Latency Transport Protocol Using Network Priorities**  
Montazeri, B., Li, Y., Alizadeh, M., Ousterhout, J., ACM  
ASSOC COMPUTING MACHINERY.2018: 221–35
- **In Search of an Understandable Consensus Algorithm** *Proceedings of the 2014 USENIX Annual Technical Conference*  
Ongaro, D., Ousterhout, J.  
2014
- **Homa: A Receiver-Driven Low-Latency Transport Protocol Using Network Priorities** *Proceedings of the ACM SIGCOMM 2018 Conference*  
Montazeri, B., Li, Y., Alizadeh, M., Ousterhout, J.  
2018
- **MilliSort and MilliQuery: Large-Scale Data-Intensive Computing in Milliseconds**  
Li, Y., Park, S., Ousterhout, J., USENIX Assoc  
USENIX ASSOC.2021: 593-612
- **A Linux Kernel Implementation of the Homa Transport Protocol**  
Ousterhout, J., USENIX ASSOC  
USENIX ASSOC.2021: 773-787
- **EPaxos Revisited**  
Tollman, S., Park, S., Ousterhout, J., USENIX Assoc  
USENIX ASSOC.2021: 613-632
- **Granular Computing**  
Lee, C., Ousterhout, J., ACM  
ASSOC COMPUTING MACHINERY.2019: 149–54
- **Exploiting Commutativity For Practical Fast Replication**  
Park, S., Ousterhout, J., USENIX Assoc  
USENIX ASSOC.2019: 47–64
- **NanoLog: A Nanosecond Scale Logging System**  
Yang, S., Park, S., Ousterhout, J., USENIX Assoc  
USENIX ASSOC.2018: 335-349
- **SLIK: Scalable Low-Latency Indexes for a Key-Value Store**  
Kejriwal, A., Gopalan, A., Gupta, A., Jia, Z., Yang, S., Ousterhout, J., USENIX Assoc  
USENIX ASSOC.2016: 57-70
- **The RAMCloud Storage System** *ACM TRANSACTIONS ON COMPUTER SYSTEMS*  
Ousterhout, J., Gopalan, A., Gupta, A., Kejriwal, A., Lee, C., Montazeri, B., Ongaro, D., Park, S. J., Qin, H., Rosenblum, M., Rumble, S., Stutsman, R., Yang, et al  
2015; 33 (3)
- **Implementing Linearizability at Large Scale and Low Latency**  
Lee, C., Park, S., Kejriwal, A., Matsushita, S., Ousterhout, J. K., Assoc Comp Machinery

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ASSOC COMPUTING MACHINERY.2015: 71-86

- **Copysets: Reducing the Frequency of Data Loss in Cloud Storage**  
Cidon, A., Rumble, S., Stutsman, R., Katti, S., Ousterhout, J., Rosenblum, M.  
2013
- **Toward Common Patterns for Distributed, Concurrent, Fault-Tolerant Code** *14th Workshop on Hot Topics in Operating Systems*  
Stutsman, R., Ousterhout, J.  
2013
- **Technical Perspective Is Scale Your Enemy, Or Is Scale Your Friend?** *COMMUNICATIONS OF THE ACM*  
Ousterhout, J.  
2011; 54 (7): 110-110
- **The Case for RAMCloud** *COMMUNICATIONS OF THE ACM*  
Ousterhout, J., Agrawal, P., Erickson, D., Kozyrakis, C., Leverich, J., Mazieres, D., Mitra, S., Narayanan, A., Ongaro, D., Parulkar, G., Rosenblum, M., Rumble, S. M., Stratmann, et al  
2011; 54 (7): 121-130
- **Fast Crash Recovery in RAMCloud** *23rd ACM Symposium on Operating Systems Principles (SOSP 2011)*  
Ongaro, D., Rumble, S. M., Stutsman, R., Ousterhout, J., Rosenblum, M.  
ASSOC COMPUTING MACHINERY.2011: 29-41
- **Integrating Long Polling with an MVC Web Framework** *USENIX Conference on Web Application Development*  
Stratmann, E., Ousterhout, J., Madan, S.  
2011: 113-124
- **Is Scale Your Enemy, Or Is Scale Your Friend?** *Technical Perspective, Communications of the ACM*  
Ousterhout, J.  
2011; 54 (7): 110
- **It's Time for Low Latency** *13th Workshop on Hot Topics in Operating Systems*  
Rumble, S., Ongaro, D., Stutsman, R., Rosenblum, M., Ousterhout, J.  
2011
- **Managing State for Ajax-Driven Web Components** *USENIX Conference on Web Application Development*  
Ousterhout, J., Stratmann, E.  
2010: 73-85
- **Fiz: A Component Framework for Web Applications** *Stanford Computer Science Department Technical Report*  
Ousterhout, J.  
2009
- **The Case for RAMClouds: Scalable High-Performance Storage Entirely in DRAM** *SIGOPS Operating Systems Review*  
Ousterhout, J., Erickson, P., Agrawal, Kozyrakis, C., Leverich, J., Mazières, D., Mitra, S.  
2009; 43 (4): 92-105
- **Scriptics Connect: An XML Integration Server Based on Tcl**  
Melski, E., Stanton, S., Ousterhout, J.  
2000
- **Integration Platforms: The Missing Link in Enterprise Computing** *Web Techniques*  
Ousterhout, J.  
1999; 4 (5): 73-76
- **The State of Tcl** *Performance Computing*  
Ousterhout, J.  
1999: 43-47
- **Free Software Needs Profit** *Communications of the ACM*  
Ousterhout, J.

1999; 42 (4): 44-45

- **Extensibility in Tcl** *Dr. Dobbs Journal*  
Ousterhout, J.  
1999: 64-72
- **The Safe-Tcl Security Model**  
Levy, J., Demailly, L., Ousterhout, J., Welch, B.  
1998
- **Scripting: Higher-Level Programming for the 21st Century** *IEEE Computer*  
Ousterhout, J.  
1998; 31 (3): 23-30
- **What's New With Tcl?** *Unix Review*  
Ousterhout, J.  
1997; 15 (11): 43-45
- **Why Threads Are A Bad Idea (for most purposes)**  
Ousterhout, J.  
1996
- **The Zebra Striped Network File System** *ACM Transactions on Computer Systems, An earlier version appears in Proc. 14th Symposium on Operating Systems Principles*  
Hartman, J., Ousterhout, J.  
1995; 13 (3): 274-310
- **Tcl and the Tk Toolkit**  
Ousterhout, J.  
Addison-Wesley.1994
- **Sawmill: A High Bandwidth Logging File System**  
Shirriff, K., Ousterhout, J.  
1994
- **Hypertools: A GUI Revolution** *The X Journal*  
Ousterhout, J., Rowe, L.  
1993; 2 (4): 74-81
- **Letter to the Editor** *ACM SIGOPS Operating Systems Review*  
Hartman, J., Ousterhout, J.  
1993; 27 (1): 7-10
- **The Zebra Striped Network File System**  
Hartman, J., Ousterhout, J.  
1993
- **Hypergraphics and Hypertext in Tk**  
Ousterhout, J.  
1993
- **THE DESIGN AND IMPLEMENTATION OF A LOG-STRUCTURED FILE SYSTEM** *ACM TRANSACTIONS ON COMPUTER SYSTEMS*  
Rosenblum, M., Ousterhout, J. K.  
1992; 10 (1): 26-52
- **Non-Volatile Memory for Fast, Reliable File Systems**  
Baker, M., Asami, S., Deprit, E., Ousterhout, J., Seltzer, M.  
1992
- **A Trace-Driven Analysis of Name and Attribute Caching in a Distributed System**  
Shirriff, K., Ousterhout, J.

1992

- **Transparent Process Migration: Design Alternatives and the Sprite Implementation** *Software Practice and Experience*  
Douglass, F., Ousterhout, J.  
1991; 21 (8): 757-785
- **The Role of Distributed State** *CMU Computer Science: A 25th Anniversary Perspective*  
Ousterhout, J.  
edited by Rashid, R.  
ACM Press.1991: 199–217
- **A Comparison of Two Distributed Systems: Amoeba and Sprite** *Computing Systems*  
Douglass, F., Kaashoek, M., F., Ousterhout, J., Tanenbaum, A., S.  
1991; 4 (4): 353-384
- **An X11 Toolkit Based on the Tcl Language**  
Ousterhout, J.  
1991
- **Robo-line Storage: Low Latency, High Capacity Storage Systems Over Geographically Distributed Networks, technical report UCB/CSD 91/651** *Computer Science Division (EECS) University of California at Berkeley*  
Katz, R., Anderson, T., Ousterhout, J., Patterson, D.  
1991
- **Availability in the Sprite Distributed File System**  
Baker, M., Ousterhout, J.  
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- **Why Aren't Operating Systems Getting Faster as Fast as Hardware?**  
Ousterhout, J.  
1990
- **The LFS Storage Manager**  
Rosenblum, M., Ousterhout, J.  
1990
- **Performance Measurements of a Multiprocessor Sprite Kernel**  
Hartman, J., Ousterhout, J.  
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- **Disk Scheduling Revisited**  
Seltzer, M., Chen, P., Ousterhout, J.  
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- **Tcl: An Embeddable Command Language**  
Ousterhout, J.  
1990
- **Sprite Engineering Manual, technical report UCB/CSD 89/512** *Computer Science Division (EECS) University of California at Berkeley*  
Ousterhout, J.  
1989
- **Process Migration in Sprite: A Status Report** *Operating Systems Technical Committee Newsletter, IEEE Computer Society*  
Douglass, F., Ousterhout, J.  
1989; 3 (1): 8-10
- **Transparent Process Migration for Personal Workstations, technical report UCB/CSD 89/540** *Computer Science Division (EECS) University of California at Berkeley*  
Douglass, F., Ousterhout, J.  
1989

- **Beating the I/O Bottleneck: A Case for Log-Structured File Systems** *Operating Systems Review*  
Ousterhout, J., Dougliis, F.  
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- **Caching in the Sprite Network File System** *ACM Transactions on Computer Systems*  
Nelson, M., Welch, B., Ousterhout, J.  
1988; 6 (1): 134-154
- **The Design of XPRS**  
Stonebraker, M., Katz, R., Patterson, D., Ousterhout, J.  
edited by Bancilhon, F., DeWitt, D., J.  
1988
- **The Sprite Network Operating System** *IEEE Computer*  
Ousterhout, J., Chersonson, A., Dougliis, F., Nelson, M., Welch, B.  
1988; 21 (2): 23-36
- **Pseudo-Devices: User-Level Extensions to the Sprite File System**  
Welch, B., Ousterhout, J.  
1988
- **Copy-on-Write for Sprite**  
Nelson, M., Ousterhout, J.  
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- **Process Migration in the Sprite Operating System**  
Dougliis, F., Ousterhout, J.  
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Ousterhout, J., Chersonson, A., Dougliis, F., Nelson, M., Welch, B.  
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- **Caching in the Sprite Network File System**  
Nelson, M., Welch, B., Ousterhout, J.  
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- **Prefix Tables: A Simple Mechanism for Locating Files in a Distributed System**  
Welch, B., Ousterhout, J.  
1986
- **Magic's Circuit Extractor** *IEEE Design and Test of Computer*  
Scott, W., Ousterhout, J.  
1986; 3 (1): 24-34
- **Design Decisions in SPUR** *IEEE Computer*  
Hill, M.  
1986; 19 (11): 8-22
- **The Magic VLSI Layout System** *IEEE Design and Test of Computers*  
Ousterhout, J., Hamachi, G., Mayo, R., Scott, W., Taylor, G.  
1985; 2 (1): 19-30
- **1985 VLSI Tools, technical report UCB/CSD 85/225**  
edited by Scott, W., Hamachi, G., Ousterhout, J.  
1985
- **Magic's Obstacle-Avoiding Global Router**  
Hamachi, G., Ousterhout, J.  
edited by Fuchs, H.

1985

- **1986 VLSI Tools, technical report UCB/CSD 86/272**

edited by Scott, W., Mayo, R., Hamachi, G.

1985

- **Magic's Circuit Extractor**

Scott, W., Ousterhout, J.

1985

- **A Trace-Driven Analysis of the UNIX 4.2 BSD File System**

Ousterhout, J., Costa, H., Da, Harrison, D., Kunze, J., Kupfer, M., Thompson, J.

1985

- **A Switch-Level Timing Verifier for Digital MOS VLSI** *IEEE Transactions on Computer-Aided Design*

Ousterhout, J.

1985; CAD-4 (3): 336-349

- **Corner Stitching: A Data Structuring Technique for VLSI Layout Tools** *IEEE Transactions on Computer-Aided Design*

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- **Plowing: Interactive Stretching and Compaction in Magic**

Scott, W., Ousterhout, J.

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- **The User Interface and Implementation of an IC Layout Editor** *IEEE Transactions on Computer-Aided Design*

Ousterhout, J.

1984; CAD-3 (3): 242-249

- **Magic's Incremental Design-Rule Checker**

Taylor, G., Ousterhout, J.

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- **Magic: A VLSI Layout System**

Ousterhout, J., Hamachi, G., Mayo, R., Scott, W., Taylor, G.

1984

- **Switch-Level Delay Models for Digital MOS VLSI**

Ousterhout, J.

1984

- **A Switchbox Router with Obstacle Avoidance**

Hamachi, G., Ousterhout, J.

1984

- **VLSI Tools and Architectures: Putting the New Technology to Work**

Ousterhout, J.

1983

- **1983 VLSI Tools, technical report UCB/CSD 83/115, Computer Science Division (EECS)**

edited by Mayo, R., Ousterhout, J., Scott, W.

1983

- **Pictures with Parentheses: Combining Graphics and Procedures in a VLSI Layout Tool**

Mayo, R., Ousterhout, J.

1983

- **Crystal: A Timing Analyzer for nMOS VLSI Circuits**

Ousterhout, J.

1983

- **Scheduling Techniques for Concurrent Systems**

Ousterhout, J.

1982

- **Measurements of a VLSI Design**

Ousterhout, J., Ungar, D.

1982

- **Lyra: A New Approach to Geometric Layout Rule Checking**

Arnold, M., Ousterhout, J.

1982

- **Caesar: An Interactive Editor for VLSI Layouts** *VLSI Design*

Ousterhout, J.

1981; 2 (4)

- **Medusa: A Distributed Operating System**

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UMI Research Press.1981

- **Medusa: An Experiment in Distributed Operating System Structure** *Communications of the ACM*

Ousterhout, J., Scelza, D., Sindhu, P.

1980; 23 (2): 92-105

- **Cm\* Kmap Microprogramming Manual and Debugger Manual**

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- **Multi-microprocessors: An Overview and Working Example**

Fuller, S., Ousterhout, J., Raskin, L., Rubinfeld, P., Sindhu, P., Swan, R.

1978

- **The Implementation of the Cm\* Multi-microprocessor**

Swan, R., Bechtolsheim, A., Ousterhout, J., Lai, K.

1977

- **Kmap Microprograms**

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1977

- **Measurements of a Distributed File System**

Baker, M., Hartman, J., Kupfer, M., Shirriff, K., Ousterhout, J.

1991, 1993

- **Arachne: Core-Aware Thread Management** *Proceedings of the 13th USENIX Symposium on Operating Systems Design and Implementation (OSDI 18)*

Qin, H., Li, Q., Speiser, J., Kraft, P., Ousterhout, J.

2018