Christopher Charles Hodsdon

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Objective: A recently graduated Computer Science PhD with experience in distributed systems and networking, interested in designing, building, maintaining, and supporting users of highly performant, scalable, distributed systems.

Projects and Experience

Google | ***Intern - Internal Cryptographic Key Management System*** Jun. 7, 2021 – Sept. 10, 2021

- Google was experiencing CPU cores that would execute instructions incorrectly; e.g., encrypting data incorrectly so that it cannot be decrypted, cryptoshredding the data. A faulty CPU cannot reliably detect that it is corrupt: the faulty CPU may be able to correctly decrypt the corrupted ciphertext.
- Determined a way to programmatically insert corruptions during compile time using LLVM, a compiler framework, to test corruption protection mechanisms by mimicking a faulty CPU. This enables the team to insert corruptions without needing to modify source code or implement specific tests.
- Implemented an LLVM pass in C++ that directly modifies LLVM's intermediate representation code to exhibit some corruption types.

PhD Dissertation Project | **Avicenna: Slowdown-Tolerance for Replicated State Machines**

- Designed a novel replicated state machine algorithm, Avicenna, that matches the normal case performance of Paxos/Raft, the current state-of-practice, but unlike them, maintains that performance in the face of a slow replica. Ensured the design was correct.
- Implemented the new algorithm in ~4 K lines of Go. Ensured the implementation was correct.
- Using Microsoft Azure for wide-area experiments and Emulab for local-area/datacenter experiments, aggressively improved Avicenna's normal case performance.
- Evaluated the improvements and tradeoffs at moderate scale (21 Azure VMs and 70 Emulab machines).

Mason: Scalable, Contiguous Sequencing for Building Consistent Services

- Designed and implemented, in ~10 K lines of C++, a distributed system, Mason, that provides a novel, stronger sequence abstraction that simplifies building consistent distributed services by making it easier to consistently order operations. Mason can scale the sequencer beyond line-rate, showing at least a 2.16x throughput increase over line-rate. Code: github.com/princeton-sns/mason.
- Implemented a new reliable transport protocol on DPDK capable of line-rate for small packets on a 10Gb NIC.
- Implemented a scalable version of ZooKeeper, a widely-used coordination service developed at Yahoo and maintained by Apache, on Mason, showing at least a 47.3x increase in throughput with 90 Emulab machines.
- Implemented a scalable distributed shared log on Mason, showing at least a 1.96x throughput increase.

Technical Skills

Experienced in: Go, C++, DPDK, C, building and testing distributed systems, Raft, Paxos, Microsoft Azure, Emulab, Linux. Knowledgeable: Python, Java.

Education

Doctor of Philosophy | ***Computer Science*** Aug. 2016 – May 2023

Master of Arts | ***Computer Science*** Sep. 2017 – Jan. 2019

Princeton University – S* Network Systems (First year of PhD completed at USC) Princeton, NJ

- Advisors: Prof. Wyatt Lloyd and Prof. Ethan Katz-Bassett (Columbia University)

Bachelor of Arts | ***Mathematical Sciences (GPA: 3.97)*** Sep. 2012 – May 2016

Rutgers, The State University of New Jersey Camden, NJ

- Mentor: Prof. Rajiv Gandhi
- Affiliations and honors societies: STEM Scholars, Computer Science Research Academy, Honors College

Publications

Avicenna: Counterfactual Evaluation for Slowdown Tolerance *In Submission*

Christopher Hodsdon, Khiem Ngo, Siddhartha Sen, Ethan Katz-Bassett, Wyatt Lloyd

Mason: Scalable, Contiguous Sequencing for Building Consistent Services May 2023

Christopher Hodsdon, Theano Stavrinos, Wyatt Lloyd, Ethan Katz-Bassett

Journal of Systems Research

The SNOW Theorem and Latency-Optimal Read-Only Transactions 2016

Haonan Lu, **Christopher Hodsdon**, Khiem Ngo, Shuai Mu, Wyatt Lloyd

The 12th USENIX Symposium on Operation Systems Design and Implementation (OSDI '16)