EMINE UGUR KAYNAR

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INTERESTS

Cloud Computing and Data Centers, Cloud Storage Systems, Caching, Distributed Systems, Large Scale Data Processing.

EDUCATION

Ph.D., Computer Science *May 2022*
Boston University
Dissertation Title: Cooperative Caching for Object Storage
Advisor: Prof. Orran Krieger

M.Sc., Computer Science *Aug. 2013*
State University of New York at Binghamton
Thesis title: Impact of Encryption on Live Virtual Machine Migration
Advisor: Assoc. Prof. Ping Yang

B.Sc., Information Systems Engineering *May 2011*
Bogazici University (Dual Diploma Program)
State University of New York at Binghamton

EXPERIENCE

- Boston University   2015 - Present
  Research Assistant | Advisors: Orran Krieger, Peter Desnoyers, Larry Rudolph
  - **D4N: Directory-Based D3N:** a distributed cache framework, that is built on top of the existing SSD-based caching system D3N to support writes, to adapt to different access patterns, and to provide application-specific specializations to target wide range of applications. D4N provides a distributed directory for a global state and exploits data immutability, one of the key features of object storage to reduce the complexity of efficient caching.

  - **D3N: Datacenter-scale Data Delivery Network:** a multi-layer cooperative cache for object stores, as a solution to network-constrained data centers. D3N enables data sharing across analytic clusters (e.g., Spark) in a data center, and dynamically adapts to changes in access patterns.

  - **Kariz: Cache Prefetching and Management:** a cache management and prefetching system for analytic frameworks that exploits the DAGs of inter-task dependencies used by data-parallel frameworks, historical run time information, and current cache state to drive caching and prefecting decisions.

  - **Bare-Metal Imaging (BMI) Service:** a generic bare-metal provisioning solution for rapid deployment of bare-metal nodes on demand, and brings attractive image management capabilities (e.g., fast snapshotting, cloning, rapid provisioning etc.) of virtualized solutions to bare-metal systems.

- Red Hat   May. 2017 - Jan. 2022
  Research Intern (Office of the CTO) | Mentors: Matt Benjamin
  - **Implementing D4N:** Implemented the D4N cache prototype for Ceph object store to support hybrid cloud use case. I am still working with the Ceph RGW team for upstreaming D4N code into Ceph.

- Upstreaming D3N into the Ceph: Worked with the Ceph RGW team on integrating the D3N cache prototype into the open source Ceph to make it available to the broader community.

Research Intern (Ceph Performance Engineering) | Mentors: Rick Sussman, Ben England
  - **Impact of Node Failure and Recovery:** Worked on the performance implications associated with node failure and recovery on Ceph object store, conducted performance tuning, and provided detailed performance insights. The analysis focused on two Ceph storage backends: *filestore* and *bluestore* and redundancy schemes: *erasure coding* and *replication*.
  - **Erasure Coding vs. Replication:** Analyzed and compared the performance of *replicated* and *erasure-coded* Ceph storage, and showed the impact of storage devices (NVMe SSDs, HDDs) and workload's I/O profiles on the performance. Identified the overheads and pointed out possible improvements that may improve redundancy solutions' performance.

- Mass Open Cloud (MOC) Alliance   2015 - Present
  Systems Researcher | Mentors: Orran Krieger, Peter Desnoyers, Ata Turk
  - **MOC Big Data Platform:** Worked with big data team to implement big data services on top of elastic OpenStack deployment, and worked on applying BMI provisioning solution for rapid deployment of bare-metal big-data platforms ondemand.
  - **MOC Monitoring Platform:** Worked on deployment of the monitoring infrastructure (*Openstack Monasca + Kafka+ InfluxDB + Grafana*) for physical servers in MOC data center.

- SUNY at Binghamton   Jul. 2012 - Aug. 2013
  Research Assistant | Advisor: Assoc. Prof. Ping Yang
  - **Impacts of encryption on VM migration:** Studied the impact of AES and 3DES encryption algorithms on two widely used live VM migration approaches (pre-copy and post-copy).

OPEN SOURCE SOFTWARE

- **D3N Data Cache For Ceph Object Storage**, Merged into the Ceph by Red Hat, 2021. [Ceph Documentation] [Github]

PROFESSIONAL SKILLS

- **Programming:** C/C++, Bash, Python, Java, SQL
- **Storage Systems:** Ceph, HDFS, Alluxio, Redis, InfluxDB, Varnish Cache
- **Big Data:** Hadoop Map-Reduce, Spark, Hive, Pig, Zookeeper
- **System Profiling:** perf, blktrace, gdb, fio, sysstat, tcpdump, wireshark, strace, pbench, valgrind
- **Others:** OpenStack, AWS, Ansible, Monasca, Ceilometer, Kafka, Grafana, S3-benchmark, Cos-Bench

PUBLICATIONS

- **E. U. Kaynar**, A. Mosayyebzadeh, M. Abdi, M. Benjamin, L. Rudolph, P. Desnoyers, O. Krieger, *Universal Data Center Cache*, **(Submitted 2022)**.

- **E. U. Kaynar**, *Cooperative Caching for Object Storage*, **Ph.D. Dissertation, 2022**.

- M. H. Hajkazemi, V. Aschenbrenner, M. Abdi, **E. U. Kaynar**, A. Mosayyebzadeh, O. Krieger, P. Desnoyers, Beating the I/O bottleneck: A Case for Log-Structured Virtual Disks, **USENIX FAST'20**.

- M. Abdi, A. Mosayyebzadeh, M.H Hajkazemi, **E. U. Kaynar**, A. Turk, L. Rudolph, O. Krieger, P. Desnoyer, A Community Cache with Complete Information, **USENIX FAST'20**.

- **E. U. Kaynar**, M Abdi, M. H. Hajkazemi, A. Turk, R. R. Sambasivan, L. Rudolph, D. Cohen, P. Desnoyers, O. Krieger, D3N: A multi-layer cache for the rest of us, **IEEE Big Data'19**.

- A. Mohan, A. Turk, R. S. Gudimetla, S. Tikale, J. Hennesey, **E. U. Kaynar**, G. Cooperman, P. Desnoyers, O. Krieger, M2: Malleable Metal as a Service, **IEEE IC2E'18**.

- J. Hennessey, S. Tikale, A. Turk, **E. U. Kaynar**, C. Hill, P. Desnoyers, O. Krieger, HIL: Designing an Exokernel for the Data Center, **ACM SoCC'16**.

- A. Turk, R. S. Gudimetla, **E. U. Kaynar**, J. Hennessey, S. Tikale, P. Desnoyers, O. Krieger, An Experiment on Bare-Metal BigData Provisioning, **USENIX HotCloud'16**.

- Y. Hu, S. Panhale, T. Li, **E. U. Kaynar**, D. Chan, U. Deshpande, P. Yang, K. Gopalan, Performance Analysis of Encryption in Securing the Live Migration of Virtual Machines, **IEEE CLOUD'15**.

- **E. U. Kaynar**, Impacts of Encryption on the Performance of Virtual Machine Migration, **M.Sc. Thesis, 2013**.

SELECTED TALKS

- **Hybrid cloud storage**, Open Cloud Workshop 2020, Boston MA, [Video]
- **Hybrid cloud storage**, DevConf.US 2020, Boston MA, [Video]
- **D3N: A multi-layer cache for data centers**, DevConf.US 2019, Boston MA, [Video]
- **D3N: A multi-layer cache for improving big-data applications' performance**, Mass Open Cloud Workshop 2019, Boston MA, [Video]
- **The Massachusetts Open Cloud: an Open Cloud eXchange**, Red Hat Summit 2017, Boston MA
- **Big Data as a Service at Mass Open Cloud**, Open Stack Summit 2017, Boston MA, [Video]

TEACHING AND MENTORING EXPERIENCE

Mentoring

Project mentor to multiple projects in the Cloud Computing course jointly thought in Boston University and Northeastern University.

- CS 528/EC 528 Cloud Computing: Accelerating Ceph Cloud Storage with D4N, team of 4 graduate students
- CS 6620/EC 528 Cloud Computing: Ceph RGW S3-Select Caching, team of 4 graduate students
- CS 591/EC 528 Cloud Computing: Ceph RGW Cache Prefetching, team of 3 graduate students
- CS 591/EC 520 Cloud Computing: Mass Open Cloud Monitoring Platform, team of 3 graduate students

Teaching Assistant

- *Department of Computer Science, Boston University*
  - CS 591/ EC500 Cloud Computing — Spring 2016
  - CS 108 Introduction to Application Programming — Spring & Fall 2014/2015
  - CS 111 Introduction to Computer Science — Summer 2015
- *Department of Computer Science, SUNY at Binghamton*
  - CS458/CS558 Introduction to Computer Security — Spring 2013
  - CS 571 Programming Languages — Fall 2012

AWARDS & HONORS

Usenix NSDI Conference Travel Grant, 2019

MEMBERSHIPS

Usenix, IEEE, ACM, ACM's Women in Computing, Women Techmakers, System Research Group at Boston University

ACTIVITIES

Filmmaking: Member of Bogazici Cinema Club. I am interested in films and film making. I made an amateur short film called "So-called Right" in 2013.

Sports: 3 times Bronze medalist in 100m backstroke in *Women National Open Swimming Championship of Turkey* from 2000 to 2002. Many times Gold medalist in 50m/100m/200m backstroke and freestyle in *Anatolia Region Swimming Championship of Turkey* from 1997 to 2009. Captain of Samsun Gazi Swimming Club from 2005 to 2009.

REFERENCES AVAILABLE TO CONTACT

- Prof. Orran Krieger
  - Professor at Boston University Computer Science and Electrical and Computer Engineering, and Cloud Computing Initiative (CCI).
  - Prof. Krieger is my Ph.D. advisor.
- Prof. Larry Rudolph
  - Principal Research Scientist at MIT CSAIL, and Vice President and Senior Researcher Two Sigma Investments.
  - Prof. Rudolph is one of my Ph.D. co-advisors.
- Prof. Peter Desnoyers
  - Associate Professor at Northeastern University Computer Science
  - Prof. Desnoyers is the PI of the Mass Open Cloud and he is also one of my Ph.D. co-advisors.
- Matt Benjamin
  - Architect and Senior Manager at Red Hat.
  - Matt Benjamin is a collaborators to the Ceph research projects and was one of my mentors for various research projects.
- Dr. Ata Turk
  - Vice President of Cloud Architecture at State Street.
  - Dr. Ata Turk was a postdoc at Boston University and Mass Open Cloud, and he was one of my mentors in various research projects.