

EMINE UGUR KAYNAR

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OVERVIEW

Interests: Computer System Design for Cloud Computing, Distributed Systems, Cloud Storage Systems, Performance Analysis and Tuning

Skills: Ceph, OpenStack, Alluxio, Hadoop, Spark, C++, Bash, Python

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

RESEARCH PROJECTS

- **Caching for Object Stores:** Lead two projects that explore the integration of distributed caching architectures into today's immutable object-based data lakes to enable data lakes to expand across the data center.
 - **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.
 - ◊ *Open Source Software: D3N Data Cache For Ceph Object Storage*, Merged into Ceph by Red Hat, 2021. [[Ceph Documentation](#)]
 - **D4N: [Directory-Based D3N](#):** a distributed cache framework, that is built on top of the existing SSD-based caching system D3N to support writes 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. A group of Red Hat Ceph developers is working with us to upstream D4N into Ceph. [[Github](#)]
- **[Kariz: Cache Prefetching and Management](#):** Involved a cache management project that explores how to integrate rich information from data analytics platforms to enable sophisticated cache management strategies. Kariz is 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 prefetching decisions.
- **[Elastic Secure Infrastructure \(ESI\)](#):** Involved ESI project which explores how to build a secure bare-metal elastic infrastructure for data centers and efficiently multiplexing bare-metal servers between different tenants. [Bare-Metal Imaging \(BMI\)](#) prototype that we developed for ESI project is 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.

INDUSTRY RESEARCH EXPERIENCE

- [Red Hat](#), Boston May. 2017 - Jan. 2022
Ph.D. Research Intern (Office of the CTO) | Mentors: [Matt Benjamin](#)
 - [Hybrid Cloud Cache](#) Implemented the initial D4N prototype for Ceph object store to support hybrid cloud use case.
 - [Upstreaming D3N into Ceph](#): Worked with Ceph RGW team on integrating the D3N cache prototype into the open source Ceph to make it available to the broader community.*Ph.D. Research Intern (Ceph Performance Engineering) | Mentors: [Rick Sussman](#), [Ben England](#)*
 - **Impact of Node Failure and Recovery**: Analyzed the performance implications associated with node failure and recovery on Ceph object store, conducted performance tuning, and provided detailed performance insights.
 - **Erase Coding vs. Replication**: Analyzed the end-to-end performance and cost impact of *replication* and *erasure-coding* for Ceph storage. Identified the overheads and pointed out possible improvements that may improve redundancy solutions' performance.
- [Mass Open Cloud \(MOC\) Alliance](#), Boston 2015 - Present
Systems Researcher | Mentors: [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 with monitoring team to deploy monitoring infrastructure in MOC data centers to collect metrics from virtual and physical servers.
- [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).

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. Hennessey, **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 taught in Boston University and Northeastern University.

- [Accelerating Ceph Cloud Storage with D4N](#), team of 4 graduate students
- [Ceph RGW S3-Select Caching](#), team of 4 graduate students
- [Ceph RGW Cache Prefetching](#), team of 3 graduate students
- [Mass Open Cloud Monitoring Platform](#), team of 3 graduate students

Teaching Assistant

Department of Computer Science, Boston University

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|---|-------------------------|
| • Cloud Computing | Spring 2016 |
| • Introduction to Application Programming | Spring & Fall 2014/2015 |
| • Introduction to Computer Science | Summer 2015 |

Department of Computer Science, SUNY at Binghamton

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| • Introduction to Computer Security | Spring 2013 |
| • Programming Languages | Fall 2012 |

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

[Prof. Larry Rudolph](#), Principal Research Scientist at MIT CSAIL, and Vice President and Senior Researcher Two Sigma Investments.

Prof. [Peter Desnoyers](#), Associate Professor at Northeastern University Computer Science

[Matt Benjamin](#), Architect and Senior Manager at Red Hat.

Dr. [Ata Turk](#), Vice President of Cloud Architecture at State Street.