

SHIXIONG QI

Assistant Professor of Computer Science
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Research Interests

Cloud computing, serverless computing, high-performance networking, cellular networks, machine learning (ML) systems

The overarching goal of my research is to design and optimize cloud-native and networked systems that enable ultra-low-latency, high-throughput services at scale. Current directions include: (1) DPU-enabled cloud frameworks for multi-tenant, zero-copy data planes that unify shared memory and RDMA for scalable, cross-node function execution. (2) Carrier-grade 5G core platforms that integrate hardware offload and fine-grained QoS to improve user-plane performance, energy efficiency, and network slicing. (3) Hybrid service meshes and cloud ingress designs that balance security, isolation, and performance in large-scale distributed environments. (4) Machine learning-assisted resource management for adaptive scheduling, traffic engineering, and performance tuning in modern cloud and edge systems.

Professional Experience and Employment

08/2024–present **Assistant Professor (tenure-track)**, *University of Kentucky*, Lexington, KY.
Department of Computer Science

2018–2024 **Research/Teaching Assistant**, *University of California, Riverside*, Riverside, CA.
Department of Computer Science and Engineering

2022–2024 **Research Intern**, Hewlett Packard Labs.

06/2021–09/2021 **Research Intern**, Intel.

Education

2018–2024 **PhD, Computer Science**, *University of California, Riverside*.
Advisor: K. K. Ramakrishnan

2015–2018 **Master of Science, Communication and Information Systems**, *Xidian University*.
Advisor: Huaxi Gu

2011–2015 **Bachelor of Science, Electronic Information Engineering**, *Nanjing University of Posts and Telecommunications*.

Honors & Awards

2025 free5GC'25 Best Paper Award

2024 Dissertation Completion Fellowship Award, UCR

2023 Dissertation Year Program Fellowship, UCR

2023 IEEE CloudNet 2023 Student Travel Grant

2022 ACM SIGCOMM 2022 Student Travel Grant

2022 IEEE ICNP 2022 Student Travel Grant

2022 IEEE 6GNet 2022 Best Paper Award

2018 Dean's Distinguished Fellowship, UCR

2017 National scholarship, Ministry of Education, China

Publications

Refereed Conferences and Workshops

[EuroSys '26] **Not A DPU in Name Only! Unleashing RDMA-capable DPUs in Multi-Tenant Serverless Clouds with NADINO**
21st European Conference on Computer Systems (*EuroSys'26*), (To appear. AR: 79/467 = 16.9%).
Shixiong Qi, Songyu Zhang, K. K. Ramakrishnan, Diman Z. Tootaghaj, Hardik Soni, Puneet Sharma

[SIGCOMM '25] **Palladium: A DPU-enabled Multi-Tenant Serverless Cloud over Zero-copy Multi-node RDMA Fabrics**
ACM SIGCOMM 2025 Conference (*SIGCOMM'25*),
Shixiong Qi, Songyu Zhang, K. K. Ramakrishnan, Diman Z. Tootaghaj, Hardik Soni, Puneet Sharma

[free5GC '25] **Rethinking 5G Core for Performance, Fairness, and Flexibility**
1st free5GC World Forum 2025 (*free5GC'25*), **Best Paper Award**
Yang-Zhe Lin, Chun-Ting Lin, Po-Yi Lin, **Shixiong Qi**, Jyh-Cheng Chen, K. K. Ramakrishnan

[MLSys '24] **LIFL: A Lightweight, Event-driven Serverless Platform for Federated Learning**
7th Annual Conference on Machine Learning and Systems (*MLSys'24*),
Shixiong Qi, K. K. Ramakrishnan, Myungjin Lee

[SoCC '24] **SURE: Secure Unikernels Make Serverless Computing Rapid and Efficient**
15th ACM Symposium on Cloud Computing (*SoCC'24*), (AR: 63/209 = 30.1%)
Federico Parola, **Shixiong Qi**, Anvaya B. Narappa, K. K. Ramakrishnan, Fulvio Risso

[LANMAN '24] **Z-Stack: A High-Performance DPDK-Based Zero-Copy TCP/IP Protocol Stack**
IEEE 30th International Symposium on Local and Metropolitan Area Networks (*LANMAN'24*),
Anvaya B. Narappa, Federico Parola, **Shixiong Qi**, K. K. Ramakrishnan

[NetSoft '23] **X-IO: A High-performance Unified I/O Interface using Lock-free Shared Memory Processing**
IEEE 9th International Conference on Network Softwarization (*NetSoft'23*),
Shixiong Qi, Han-Sing Tsai, Yu-Sheng Liu, K. K. Ramakrishnan, Jyh-Cheng Chen

[CloudNet '23] **L²5GC⁺: An Improved, 3GPP-compliant 5G Core for Low-latency Control Plane Operations**
IEEE 12th International Conference on Cloud Networking (*CloudNet'23*),
Yu-Sheng Liu, **Shixiong Qi**, Po-Yi Lin, Han-Sing Tsai, K. K. Ramakrishnan, Jyh-Cheng Chen

[NetSoft '22] **MiddleNet: A High-Performance, Lightweight, Unified NFV and Middlebox Framework**
IEEE 8th International Conference on Network Softwarization (*NetSoft'22*),
Ziteng Zeng, Leslie Monis, **Shixiong Qi**, K. K. Ramakrishnan

[SIGCOMM '22] **SPRIGHT: Extracting the Server from Serverless Computing! High-performance eBPF-based Event-driven, Shared-memory Processing**
ACM SIGCOMM 2022 Conference (*SIGCOMM'22*),
Shixiong Qi, Leslie Monis, Ziteng Zeng, Ian-chin Wang, K. K. Ramakrishnan

[SIGCOMM '22] **L²5GC: A Low Latency 5G Core Network based on High-performance NFV Platforms**
ACM SIGCOMM 2022 Conference (*SIGCOMM'22*),
Vivek Jain, Hao-Tse Chu, **Shixiong Qi**, Chia-An Lee, Hung-Cheng Chang, Cheng-Ying Hsieh, K. K. Ramakrishnan, Jyh-Cheng Chen

[6GNet '22] **Evolving to 6G: Improving the Cellular Core to Lower Control And Data Plane Latency**
1st International Conference on 6G Networking (*6GNet'22*), **Best Paper Award**
Vivek Jain, Sourav Panda, **Shixiong Qi**, K. K. Ramakrishnan

[NAS '21] **Towards a Proactive Lightweight Serverless Edge Cloud for Internet-of-Things Applications**

IEEE 15th International Conference on Networking, Architecture and Storage (**NAS'21**),
Ian-Chin Wang, **Shixiong Qi**, Elizabeth Liri, K. K. Ramakrishnan

Refereed Journals

[Internet Computing '24] **L²6GC: Evolving the Low-Latency Core for Future Cellular Networks**
IEEE Internet Computing, Volume: 28, Issue: 2, Pages: 29–36, March/April 2024
Shixiong Qi, K. K. Ramakrishnan, Jyh-Cheng Chen

[ToN '24] **SPRIGHT: High-Performance eBPF-Based Event-Driven, Shared-Memory Processing for Serverless Computing**
IEEE/ACM Transactions on Networking (**ToN**), Volume: 32, Issue: 3, Pages: 2539–2554, February 2024
Shixiong Qi, Leslie Monis, Ziteng Zeng, Ian-Chin Wang, K. K. Ramakrishnan

[TNSM '23] **MiddleNet: A Unified, High-Performance NFV and Middlebox Framework With eBPF and DPDK**
IEEE Transactions on Network and Service Management (**TNSM**), Volume: 20, Issue: 4, Pages: 3950–3967, March 2023
Shixiong Qi, Ziteng Zeng, Leslie Monis, K. K. Ramakrishnan

[TNSM '20] **Assessing Container Network Interface Plugins: Functionality, Performance, and Scalability**
IEEE Transactions on Network and Service Management (**TNSM**), Volume: 18, Issue: 1, Pages: 656–671, December 2020
Shixiong Qi, Sameer G. Kulkarni, K. K. Ramakrishnan

[OSN '19] **SMONoC: Optical Network-on-chip Using A Statistical Multiplexing Strategy**
Optical Switching and Networking (**OSN**), Volume: 34, Pages: 1-9, November 2019
Kun Wang, **Shixiong Qi**, Zheng Chen, Yintang Yang, Huaxi Gu

[ELEX' 19] **ALPHA: A Hybrid Topology for Memory-centric Network**
IEICE Electronics Express (**ELEX**), Volume 16, Pages: 1-6, February 2019
Jiaxiang Li, Huaxi Gu, **Shixiong Qi**, Haoran Wang, Kang Wang

[ELEX' 16] **Panzer: A 6×6 Photonic Router for Optical Network on Chip**
IEICE Electronics Express (**ELEX**), Volume: 13, Issue: 21, Pages: 1-6, September 2016
Lei Huang, Kun Wang, **Shixiong Qi**, Huaxi Gu, Yintang Yang

Patents

2019 **Three-dimensional Optical On-chip Network Using A Ring-based Control Network and its Communication Method**, *P.R.C. Patent*, No. CN106331909B, Granted (Oct 11, 2019).
Huaxi Gu, Bowen Zhang, Kun Wang, Yintang Yang, Zhangming Zhu, **Shixiong Qi**, Wei Tan

2019 **Scalable Optical On-chip Network Structure based on Double-layer Layout and its Communication Method**, *P.R.C. Patent*, No. CN106936736B, Granted (May 21, 2019).
Huaxi Gu, Lei Huang, Yintang Yang, Zhangming Zhu, **Shixiong Qi**, Kun Wang

2019 **A Multi-port Scalable On-chip Optical Router Supporting Multicast Communication**, *P.R.C. Patent*, No. CN105847166B, Granted (May 7, 2019).
Lei Huang, Kun Wang, Huaxi Gu, Yintang Yang, **Shixiong Qi**, Wei Tan

2019 **Micro-ring Resonator-based Optical Network Architecture for Memory Interconnect and its Communication Method**, *P.R.C. Patent*, No. CN105635861B, Granted (Feb 22, 2019).
Huaxi Gu, Yue Wang, Kun Wang, Yintang Yang, Kang Wang, **Shixiong Qi**

2018 **An Optical Network-on-Chip System and Communication Scheme based on Statistical Multiplexing Strategy**, *P.R.C. Patent*, No. CN105812063B, Granted (Aug 3, 2018).
Kun Wang, *Shixiong Qi*, Zheng Chen, Huaxi Gu, Yintang Yang, Long Zhao

Talks and Presentations

2024 **SURE: Secure Unikernels Make Serverless Computing Rapid and Efficient.**
Conference proceedings talk, ACM SoCC 2024, Redmond, WA

2024 **Z-stack: A High-performance DPDK-based Zero-copy TCP/IP Protocol Stack.**
Conference proceedings talk, IEEE LANMAN 2024, Boston, MA

2023 **L²5GC+: An Improved, 3GPP-compliant 5G Core for Low-latency Control Plane Operations.**
Conference proceedings talk, IEEE CloudNet 2023, Hoboken, NJ

2022 **SPRIGHT: Extracting the Server from Serverless Computing! High-performance eBPF-based Event-driven, Shared-memory Processing.**
Invited talk at Vmware, Online, 2022

2022 **SPRIGHT: Extracting the Server from Serverless Computing! High-performance eBPF-based Event-driven, Shared-memory Processing.**
Conference proceedings talk, ACM SIGCOMM 2022, Amsterdam, the Netherlands

2022 **MiddleNet: A High-Performance, Lightweight, Unified NFV and Middlebox Framework.**
Conference proceedings talk, IEEE NetSoft 2022, Online

2021 **Mu: An Efficient, Fair and Responsive Serverless Framework for Resource-Constrained Edge Clouds.**
Conference proceedings talk, ACM SoCC 2021, Online

2021 **Assessing Container Network Interface Plugins: Functionality, Performance, and Scalability.**
Invited talk at Brown University, Nov-15-2021, Online

2020 **Understanding Container Network Interface Plugins: Design Considerations and Performance.**
Conference proceedings talk, IEEE LANMAN 2020, Online

Teaching and Mentoring

Teaching

2026 **CS371 Introduction to Computer Networking.**
Instructor, University of Kentucky, Spring 2026

2025 **CS687-001 Special Topics in Systems: Fundamentals and Trends.**
Instructor, University of Kentucky, Fall 2025

2025 **CS371 Introduction to Computer Networking.**
Instructor, University of Kentucky, Spring 2025

2024 **CS687-001, Special Topics in Systems: Fundamentals and Trends.**
Instructor, University of Kentucky, Fall 2024

2023 **CS208 Cloud Computing and Cloud Networking.**
Student Mentor, UC Riverside, Winter 2023

2022 **CS208 Cloud Computing and Cloud Networking.**
Student Mentor, UC Riverside, Winter 2022

2021 **CS208 Cloud Computing and Cloud Networking.**
Student Mentor, UC Riverside, Winter 2021

2020 **CS164 Computer Networks.**
Teaching Assistant and Lab instructor, UC Riverside, Fall 2020

2020 **CS179I Project in Computer Science (Networks).**
Teaching Assistant, UC Riverside, Spring 2020

2019 **CS164 Computer Networks.**
Teaching Assistant and Lab instructor, UC Riverside, Fall 2019

2019 **CS203 Advanced Computer Architecture.**
Teaching Assistant and Lab instructor, UC Riverside, Fall 2019
Mentoring (students with publications or master's project)

2023 **Bharath Nagendra.**
Master student at UCR, now at Apple

2023 **Abhishek Sharma.**
Master student at UCR, now at tZERO

2023 **Gaurav Gadewar.**
Master student at UCR, now at Esri

2022 **Leslie Monis.**
Master student at UCR, now at Nvidia

2022 **Ziteng Zeng.**
Master student at UCR, now at Google

Professional Services

University, College, and Department Service

2024-2025 **Computer Science Graduate Admissions Committee, UKY.**
Conference Organizer and Community Services

2025 **free5GC, Publicity Co-Chair, 1st free5GC World Forum.**

2024 **MASS, Publicity Co-Chair, 21st IEEE International Conference on Mobile Ad-Hoc and Smart Systems.**
Technical Program Committee

2027 **NSDI, 24th USENIX Symposium on Networked Systems Design and Implementation.**

2026 **ICDCS, 46th IEEE International Conference on Distributed Computing Systems.**

2026 **EuroSys, 21st European Conference on Computer Systems: Fall cycle.**

2026 **NSDI, 23rd USENIX Symposium on Networked Systems Design and Implementation: Spring cycle + Fall cycle.**

2025 **free5GC, 1st free5GC World Forum.**

2025 **ICDCS, 45th IEEE International Conference on Distributed Computing Systems.**
Journal Reviews

2024 **TMC, IEEE Transactions on Mobile Computing.**

2024 **TC, IEEE Transactions on Computers.**

2024 **TPDS, IEEE Transactions on Parallel and Distributed Systems.**

2024 **TOIT, ACM Transactions on Internet Technology.**

2024 **IEEE Network, IEEE Network.**

2024 **IET Network, IET Network.**

2024 **Parallel Computing, Parallel Computing.**

Others
2025 NSF Reviewer