

HONGQIANG LIU, PH.D.

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PROFESSION

Alibaba Group (US), Bellevue WA *Dec 2017 - present*

Founder & Director of Network R&D Group in the Alibaba Infrastructure *2017 - present*

Team Missions: Solving critical and cutting-edge problems in the production network infrastructure and strategizing the technical revolution roadmap of the network infrastructure in Alibaba.

Founder & Director of R&D Group in Alibaba 5G/6G New Business Incubator *2019 - present*

Team Missions: Strategizing the commercial and technical development directions in the 5G and 6G era for Alibaba Cloud and building private 5G solutions for Industry 4.0.

Director of Engineering in Edge Network Group in the Alibaba Infrastructure *2021 - present*

Team Missions: Building and operating a hardware-based cloud network virtualization and security solution for Alibaba edge cloud.

Microsoft Research, Redmond WA *July 2014 - Dec 2017*

Senior Researcher in Mobility & Network Research Group

Duties: innovating new methodologies and building new systems to enhance the reliability and performance of Azure networking.

PROJECTS & ACHIEVEMENTS (SELECTED)

SNA: Programmable Network Gateway in Alibaba Edge Cloud

Building a hyper-converged network gateway on top of a programmable network ASIC to achieve bare-metal hosting and other necessary network functions (*e.g.* LB, NAT, EIP, DDoS, *etc.*) with high-performance and limited resource overhead in edge cloud environments. This solution enables the **first-ever** commercial deployments of the large-scale online gaming in edge clouds in China. This is a successful example of how our technical innovations transfer to business values – the ability to develop, verify, test, and optimize programmable network hardware platforms becomes the key to hosting bare-metal game servers in resource-limited edge clouds.

HPCC: High-Speed Congestion Control in Alibaba's Data Center Network

HPCC is a new generation of congestion control in data centers that **first-ever** takes advantage of the in-band network telemetry (INT) to perform fine-grained and accurate congestion control. It solves the challenges brought by the rapidly increasing network interface speed and the complex parameter tuning of the state-of-the-art. It has become the default option for the cloud storage, AI clusters, and database in Alibaba Cloud. It is also implemented by many mainstreaming hardware vendors like Intel and Nvidia.

Leadership and Reputation: According to AI2000 Research Influence Ranking, the Alibaba network R&D group that I founded and led was placed in the global top-10, including prestigious institutes like Google, Microsoft, MIT, and Stanford, and the 1st in China. Note that this group was founded only about 4.5 years.

Academic Services: TPC (technical program committee) members of ACM SIGCOMM and USENIC NSDI; Chair of Asian-Pacific Work Group for Networking.

Open Source Software: FreeFlow is a high-speed RDMA virtualization framework for containers. It was open-sourced in GitHub and won 500+ stars so far, and I am its primary designer and developer.

EDUCATION

Yale University, United States

August 2010 - May 2014

Doctor of Philosophy

Department of Computer Science

Winner of 2015 ACM SIGCOMM Doctoral Dissertation Award - Honorable Mention

Tsinghua University, China

August 2003 - July 2010

Master & Bachelor of Engineering

Department of Electronic Engineering

Topic-1: New Generation of Data Center Network with Programmable Data Plane

- Yu Zhou, Chen Sun, Hongqiang Harry Liu, Rui Miao, Shi Bai, Zhilong Zheng, Lingjun Zhu, Zhen Shen, Yongqing Xi, Pengcheng Zhang, Dennis Cai, Ming Zhang, Mingwei Xu. *Flow Event Telemetry on Programmable Data Plane*. [SIGCOMM'20](#).
- Jiaqi Gao, Ennan Zhai, Hongqiang Harry Liu, Rui Miao, Yu Zhou, Bingchuan Tian, Chen Sun, Dennis Cai, Ming Zhang, Minlan Yu. *Lyra: A Cross-Platform Language and Compiler for Data Plane Programming on Heterogeneous ASICs*. [SIGCOMM'20](#).
- Yuliang Li, Rui Miao, Hongqiang Harry Liu, Yan Zhuang, Fei Feng, Lingbo Tang, Zheng Cao, Ming Zhang, Frank Kelly, Mohammad Alizadeh, Minlan Yu. *HPCC: High Precision Congestion Control*. [SIGCOMM'19](#).
- Daehyeok Kim, Amirsaman Memaripour, Anirudh Badam, Yibo Zhu, Hongqiang Harry Liu, Jitu Padhye, Shachar Raindel, Vyas Sekar, Srinivasan Seshan, Steven Swanson. *HyperLoop: Group-based NIC Offloading to Accelerate Replicated Transactions in Multi-Tenant Storage Systems*. [SIGCOMM'18](#).

Topic-2: Network Validation in Large-Scale Production Deployments

- Bingchuan Tian, Jiaqi Gao, Mengqi Liu, Ennan Zhai, Yanqing Chen, Yu Zhou, Li Dai, Feng Yan, Mengjing Ma, Ming Tang, Jie Lu, Xionglie Wei, Hongqiang Harry Liu, Ming Zhang, Chen Tian, Minlan Yu. *Aquila: A Practically Usable Verification System for Production-Scale Programmable Data Planes*. [SIGCOMM'21](#).
- Fangdan Ye, Da Yu, Ennan Zhai, Hongqiang Harry Liu, Bingchuan Tian, Qiaobo Ye, Chunsheng Wang, Xin Wu, Tianchen Guo, Cheng Jin, Duncheng She, Qing Ma, Biao Cheng, Hui Xu, Ming Zhang, Zhiliang Wang, Rodrigo Fonseca. *Accuracy, Scalability, Coverage – A Practical Configuration Verifier on a Global WAN*. [SIGCOMM'20](#).
- Bingchuan Tian, Xinyi Zhang, Ennan Zhai, Hongqiang Harry Liu, Qiaobo Ye, Chunsheng Wang, Xin Wu, Zhiming Ji, Yihong Sang, Ming Zhang, Da Yu, Chen Tian, Ben Zhao, Heather Zheng. *Safely and Automatically Updating In-Network ACL Configurations with Intent Language*. [SIGCOMM'19](#).
- Hongqiang Harry Liu, Yibo Zhu, Jitu Padhye, Jiaxin Cao, Sri Tallapragada, Nuno Lopes, Andrey Rybalchenko, Guohan Lu, Lihua Yuan. *CrystalNet: Faithfully Emulating Large Production Networks*. [SOSP'19](#).
- Aaron Gember-Jacobson, Aditya Akella, Ratul Mahajan, Hongqiang Harry Liu. *Automatically Repairing Network Control Planes Using an Abstract Representation*. [SOSP'19](#).

Topic-3: AI & Network

- Juncheng Gu, Mosharaf Chowdhury, Kang G. Shin, Yibo Zhu, Myeongjae Jeon, Junjie Qian, Hongqiang Harry Liu, Chuanxiong Guo. *Tiresias: A GPU Cluster Manager for Distributed Deep Learning*. [NSDI'19](#).
- Behnaz Arzani, Selim Ciraci, Luiz Chamon, Yibo Zhu, Hongqiang Harry Liu, Jitu Padhye, Geoff Outhred, Boon Thau Loo. *007: Democratically Finding The Cause of Packet Drops*. [NSDI'18](#).
- Omid Alipourfard, Hongqiang Harry Liu, Jianshu Chen, Shivaram Venkataraman, Minlan Yu, Ming Zhang. *CherryPick: Adaptively Unearthing the Best Cloud Configurations for BigData Analytics*. [NSDI'17](#).

Other Topics: Container Networks, Cloud, Video Transport and Wireless

- Zhilong Zheng, Yunfei Ma, Yanmei Liu, Furong Yang, Zhenyu Li, Yuanbo Zhang, Jiuhai Zhang, Wei Shi, Wentao Chen, Ding Li, Qing An, Hai Hong, Hongqiang Harry Liu, Ming Zhang. *XLINK: QoE-Driven Multi-Path QUIC Transport in Large-scale Video Services*. [SIGCOMM'21](#).
- Daehyeok Kim, Tianlong Yu, Hongqiang Harry Liu, Yibo Zhu, Jitu Padhye, Shachar Raindel, Chuanxiong Guo, Vyas Sekar, Srinivasan Seshan. *FreeFlow: Software-based RDMA Virtual Networking for Containerized Clouds*. [NSDI'19](#).
- Danyang Zhuo, Kaiyuan Zhang, Yibo Zhu, Hongqiang Harry Liu, Matthew Rockett, Arvind Krishnamurthy, Thomas Anderson. *Slim: OS Kernel Support for a Low-Overhead Container Overlay Network*. [NSDI'19](#).
- Hongqiang Harry Liu, Raajay Viswanathan, Matt Calder, Aditya Akella, Ratul Mahajan, Jitendra Padhye, Ming Zhang. *Efficiently Delivering Online Services over Integrated Infrastructure*. [NSDI'16](#).

- Renjie Zhao, Purui Wang, Xianshang Lin, Yunfei Ma, Pengyu Zhang, Hongqiang Harry Liu, Xinyu Zhang, Chenren Xu, Ming Zhang. *NFC+: Breaking NFC Networking Limits through Resonance Engineering*. [SIGCOMM'20](#).

PUBLICATION (PRE-GRADUATION)

- Hongqiang Harry Liu, Srikanth Kandula, Ratul Mahajan, Ming Zhang, David Gelernter. *Traffic Engineering with Forward Fault Correction*. [SIGCOMM'14](#).
- Rohan Gandhi, Hongqiang Harry Liu, Y. Charlie Hu, Guohan Lu, Jitu Padhye, Lihua Yuan, Ming Zhang. *Duet: Cloud Scale Load Balancing with Hardware and Software*. [SIGCOMM'14](#).
- Xin Jin, Hongqiang Harry Liu, Rohan Gandhi, Srikanth Kandula, Ratul Mahajan, Jennifer Rexford, Roger Wattenhofer, Ming Zhang. *Dynamic Scheduling of Network Updates*. [SIGCOMM'14](#).
- Hongqiang Harry Liu, Xin Wu, Ming Zhang, Lihua Yuan, Roger Wattenhofer, David Maltz. *zUpdate: Updating Data Center Networks With Zero Loss*. [SIGCOMM'13](#).
- Hongqiang Harry Liu, Ye Wang, Yang Richard Yang, Hao Wang, Chen Tian. *Optimizing Cost and Performance for Content Multihoming*. [SIGCOMM'12](#).