

# JIACHENG MA

*Ph.D. Candidate*

Computer Science and Engineering  
University of Michigan

2260 Hayward Street  
Ann Arbor, MI 48109, USA

jcma@umich.edu  
<https://jcma.me>

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## RESEARCH INTERESTS

My research is at the bottom of the software stack. I am interested in improving the programmability, debuggability, and deployability of heterogeneous systems by building systems software support such as hypervisors, compilers, debuggers, and runtimes.

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## EDUCATION

### University of Michigan

*Ann Arbor, MI, USA*

*Ph.D. Candidate in Computer Science*

Sept. 2018 – Present

Thesis Topic: Failure Reproduction on FPGA

Advisor: Prof. Baris Kasikci

### Shanghai Jiao Tong University

*Shanghai, China*

*B.E. in Software Engineering*

Sept. 2014 – June 2018

Thesis: Efficient GPU Live Migration Optimized by Software Dirty Page for Full Virtualization

Advisor: Prof. Zhengwei Qi

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## PEER-REVIEWED PUBLICATIONS

- [1] DOLMA: Securing Speculation with the Principle of Transient Non-Observability. Kevin Loughlin, Ian Neal, Jiacheng Ma, Elisa Tsai, Ofir Weisse, Satish Narayanasamy, and Baris Kasikci. *USENIX Security*, 2021. (To Appear).
- [2] A Hypervisor for Shared-Memory FPGA Platforms. Jiacheng Ma, Gefei Zuo, Kevin Loughlin, Xiaohe Cheng, Yanqiang Liu, Abel Mulugeta Eneyew, Zhengwei Qi, and Baris Kasikci. *Proceedings of the 25th International Conference on Architectural Support for Programming Languages and Operating Systems*, 2020.
- [3] gRemote: API-Forwarding Powered Cloud Rendering. Dongjie Tang, Yun Wang, Linsheng Li, Jiacheng Ma, Xue Liu, Zhengwei Qi, and Haibing Guan. *Proceedings of the 29th International Symposium on High-Performance Parallel and Distributed Computing*, pages 197–201, 2020.
- [4] gMig: Efficient vGPU Live Migration with Overlapped Software-based Dirty Page Verification. Qiumin Lu, Xiao Zheng, Jiacheng Ma, Yaozu Dong, Zhengwei Qi, Jianguo Yao, Bingsheng He, and Haibing Guan. *IEEE Transactions on Parallel and Distributed Systems*, 2019.
- [5] gMig: Efficient GPU Live Migration Optimized by Software Dirty Page for Full Virtualization. Jiacheng Ma, Xiao Zheng, Yaozu Dong, Wentai Li, Zhengwei Qi, Bingsheng He, and Haibing Guan. *Proceedings of the 14th ACM SIGPLAN/SIGOPS International Conference on Virtual Execution Environments*, pages 31–44, 2018.
- [6] Scalable GPU Virtualization with Dynamic Sharing of Graphics Memory Space. Mochi Xue, Jiacheng Ma, Wentai Li, Kun Tian, Yaozu Dong, Jinyu Wu, Zhengwei Qi, Bingsheng He, and Haibing Guan. *IEEE Transactions on Parallel and Distributed Systems*, 29(8):1823–1836, 2018.

- [7] gScale: Scaling up GPU Virtualization with Dynamic Sharing of Graphics Memory Space. Mochi Xue, Kun Tian, Yaozu Dong, Jiacheng Ma, Jiajun Wang, Zhengwei Qi, Bingsheng He, and Haibing Guan. *Proceedings of the 2016 USENIX Conference on Usenix Annual Technical Conference*, pages 579–590, 2016.

## RESEARCH EXPERIENCE

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- Efes Lab**, advised by Prof. Baris Kasikci *University of Michigan*  
*Secure Speculative Execution* [1] Jan. 2020 – Apr. 2020
  - This work presents the first defense scheme to provide automatic comprehensive protection against all known transient execution attacks.*Hardware-Assisted Bug Reproduction* Aug. 2019 – Apr. 2020
  - This work combines online record & replay and offline symbolic execution to recover failing program executions with low overhead and high accuracy.*FPGA Virtualization* [2] Apr. 2018 – Aug. 2019
  - In this project, we create the first scalable hypervisor for shared-memory FPGA platforms. The hypervisor, called OPTIMUS, supports both spatial multiplexing and temporal multiplexing, and scales linearly until the memory bandwidth is saturated. OPTIMUS helps data center operators to deploy multiple shared-memory accelerators on the same FPGA, thus maximizing the resource utilization.**TCloud Lab**, advised by Prof. Zhengwei Qi *Shanghai Jiao Tong University*  
*Remote Rendering* [3] Mar. 2018 – May 2018
  - This work enables API-forwarding based cloud rendering for OpenGL applications on a resource pool.*Optane as Memory* Aug. 2017 – June 2018
  - This work explores using NVM (Intel Optane) as main memory for KVM guests. (This project is a collaboration between TCloud Lab and Intel.)*vGPU Live Migration* [4, 5] Dec. 2016 – July 2017
  - Intel GVT-g is an open-source KVM/Xen based full GPU virtualization solution; however, it lacks the feature of live migration. This work enables live migrating vGPUs for cloud applications such as virtual desktops, cloud gaming farms, cloud transcoding services, etc. (This project is a collaboration between TCloud Lab and Intel.)*Scaling up GPU Virtualization* [6, 7] Jan. 2016 – Mar. 2017
  - This project scales up the maximum number of vGPUs in Intel GVT-g and minimizes the performance impact. In Haswell architecture, Intel GVT-g only supports 3 guests; gScale extends it for 5×. This work makes GVT-g more consolidated, since more VMs with vGPU can be depolyed on one physical machine. (This project is a collaboration between TCloud Lab and Intel.)

## EMPLOYMENT

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- Intel Asia-Pacific Research & Development Ltd** *Shanghai, China*  
*Software Developer Intern* July 2016 – June 2018  
Advisor: Dr. Yaozu Dong
- Intel Lab** *Hillsboro, Oregon*  
*Graduate Technical Intern* June 2020 – Aug. 2020  
Advisor: Dr. Sanjay Kumar

## TEACHING

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- Programming and Data Structure (SE 117)** *Shanghai, China*  
*Teaching Assistant* for Prof. Zhengwei Qi at Shanghai Jiao Tong University Feb. 2016 – June 2016

## AWARDS AND HONORS

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ASPLOS Student Travel Grant	2020
SOSP Student Travel Grant	2019
ASPLOS/VEE Student Travel Grant	2018

## TECHNICAL SKILLS

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Programming Language: C, C++, Verilog, System Verilog  
Virtualization: KVM, QEMU, Mediated Pass-Through  
Program Analysis: KLEE, Yosys

## REFERENCES

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Available upon request