Changhao Wu

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Education

Xi'an Jiaotong University, Xi'an, China — September 2015 – May 2019

Bachelor in Computer Science and Technology
GPA: 3.8/4.3 Rank: Top 5/158

University of California, San Diego, La Jolla, CA — February 2017 - June 2017

Exchange student in Computer Science and Engineering
GPA: 4.0

Brown University, Providence, RI — August 2019 - Present

Master of Science in Computer Science
Current GPA: 4.0

Research

Ministry of Education Key Lab for Intelligent Networks and Network Security — Xi'an, China

Advised by Prof. Hao Li, Prof. Chengchen Hu — 2017 – 2019

Project: *Programming Network Stack for Middleboxes with Rubik*

- Designed Rubik, a domain-specific language for the middlebox stack, which decreases coding efforts for building a TCP/IP stack by two orders of magnitude (*e.g.*from 20,000 lines to 300 lines).
- Prototyped the compiler of Rubik and built various realistic cases using Rubik language, including 12 reusable protocol parsers, 4 network stacks, and 3 open-source middleboxes.
- Conducted optimizations in the IR and the backend of the compiler for improving the processing throughput, *e.g.*, the TCP/IP stack built on Rubik outperformed state-of-the-art by 23%.

Brown Systems Research Group — Brown University, Providence, RI

Advised by Prof. Theophilus Benson — Aug 2019 - Present

Current Project: aFabric: Towards a Holistic View for Managing Hardware Accelerators in the Cloud

- Analyze and model the data dependency and consistency in P4 programs.
- Formalize the optimization problem of deploying P4 applications across the accelerators.
- Design heuristics to reduce the searching space and solving time.

Publication

Programming Network Stack for Middleboxes with Rubik
Hao Li, **Changhao Wu**, Guangda Sun, Peng Zhang, Danfeng Shan, Tian Pan, Chengchen Hu
Usenix NSDI 2021

Professional Experience

Intern @ Compiler Team, Barefoot Network Division, Intel — Jun - Aug 2020

- Understood implementation of a compiler and got familiar with p4c compiler.
- Created a new backend for P4->DPDK translation, translating P4 code to an assembly-like format.
- Modified a lisp parser to parse the assembly and load the instructions into P4 DPDK runtime on the fly.

Skills

- Programming Languages: C = Python = P4 = C++ > MATLAB > SQL
- Familiar with systems development tools: bash, ssh, gcc, make, docker, k8s *etc*.