RUNCHAO HAN

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EDUCATION

Monash University and CSIRO-Data61 *February 2019 - Present*
Doctor of Philosophy Supervisors: Jiangshan Yu, Joseph Liu and Shiping Chen
Faculty of Information Technology and Distributed Systems Security group

The University of Manchester *August 2017 - September 2018*
MSc Advanced Computer Science Supervisor: Christos Kotselidis
School of Computer Science Overall Percentage: 82/100

Beijing University of Posts and Telecommunications *September 2013 - July 2017*
BSc E-Commerce Engineering with Law Overall Percentage: 83/100

RESEARCH

On the optionality and fairness of Atomic Swap

- We showed the HTLC-based Atomic Swap equals to an American Call Option without premium.
- We evaluated the unfairness of HTLC-based Atomic Swaps using Cox-Ross-Rubinstein model.
- We fixed such unfairness of HTLC-based Atomic Swap by paying the premium during the swap.

Challenging the honest majority assumption of permissionless blockchains

- We experimentally showed that the current incentive mechanism may encourage rational participants to launch 51% attacks.
- We formally modelled 51% attacks with external mining power as a Markov Decision Process.
- We evaluated such 51% attacks and found that, 51% attacks are feasible and profitable for most mainstream PoW-based blockchains.

Analysis and Optimizations of Memory-Hard PoW Algorithms

- We surveyed state-of-the-art Proof-of-Work algorithms deployed in prevalent cryptocurrencies.
- We profiled CUDA implemented memory-hard PoW algorithms: Ethash, CryptoNight and Scrypt.
- We optimised the Ethash CUDA implementation on Nvidia's GPUs.

WORK EXPERIENCE

Bytom Blockchain, Hangzhou, China September 2018 - January 2019
Intern Blockchain Engineer *Hangzhou, China*

· Developed and refactored the original mining pool of the Bytom blockchain
· Developed the first version of the heterogeneous desktop grid computing platform based on the mining pool and the AI cloud platform
· Research on state-of-the-art technologies to improve the Bytom blockchain (sharding, consensus and P2P) and the cryptocurrency mining pool

CNIC, Chinese Academy of Sciences, Beijing, China June 2017 - July 2017
Intern Researcher *Beijing, China*

· Designed the Solidity smart contracts for electronic licenses library based on Ethereum
· Deployed smart contracts on Docker containers of Geth/TestRPC clients
· Implemented the front-end client of the DApp based on Web3 and Truffle

SELECTED PUBLICATIONS

- Runchao Han, Zhimei Sui, Jiangshan Yu, Joseph Liu, Shiping Chen. Sucker Punch Makes You Richer: Rethinking Proof-of-Work Security. In submission.
- Runchao Han, Haoyu Lin, Jiangshan Yu. On the optionality and fairness of Atomic Swaps. AFT'19.
- Runchao Han, Nikolaos Foutris and Christos Kotselidis. Demystifying Crypto Mining: Performance Analysis and Optimizations of PoW Algorithms. ISPASS'19.

TECHNICAL STRENGTHS

Programming Languages	C++, Go, Rust, Java, Python
Blockchains	Bitcoin, Ethereum, Monero
Parallel Programming	CUDA, OpenMP, MPI
Cryptography	Libsodium, Ring (Rust), golang/crypto

ADDITIONAL INFORMATION

Github	SebastianElvis
Blog	SebastianElvis.github.io
Wechat	elvisage