Yuchao (Richard) Qian

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Education

Shanghai Jiao Tong University 2020/9 – 2023/3
Master's degree, Software Engineering Shanghai, China
Ranked #1 in the Graduate Entrance Examination (Kaoyan).

Changzhou University 2015/9 – 2020/6
Bachelor's degree, Internet of Things Engineering Changzhou, Jiangsu, China

Work Experience

RisingWave Labs 2022/6 – now
Database Kernel Engineer (Rust) Shanghai, China & Singapore
Contributed to **RisingWave**, an open source PostgreSQL-compatible database optimized for incrementally maintaining materialized views on streaming data.

- **Window Functions.** Implemented the OverWindow operator, to support batch and streaming window functions, including `rank()` and all aggregation functions over several kinds of window frames (`ROWS`, `RANGE`, `SESSION`).
- **Emit-On-Window-Close Mode.** Implemented the streaming Emit-On-Window-Close mode, to support data emission driven by watermarks. This significantly reduced redundant computation and I/O in a wide range of user cases.
- **Performance Improvement.** Implemented several optimization strategies for Aggregate and TopN operators, including 2-phase aggregation, aggregate de-duplication (~20% throughput increase), state table merging (~10%), better distinct aggregator (~50%), and better TopN cache (unnecessary table scan operations dropped from ~50% to almost 0%).
- **Misc Maintenance.** Participated in the daily maintenance, including miscellaneous features, bug fixes and refactoring. Mainly contributed to data order consistency (utilizing Rust type checker), thorough refactoring of Aggregate and other operators, inconsistent stream toleration, schema correctness and tools enhancing developer experience.

Institute of Parallel and Distributed Systems (IPADS) 2020/8 – 2022/6
Operating System Developer (C, C++, CMake, Shell, ARM64 Assembly) Shanghai, China
As a master student at the world-leading lab in OS area, contributed to **ChCore**, a POSIX-compatible multi-purpose microkernel operating system developed from scratch.

- **Device Drivers and POSIX Compatibility (The Ecosystem).** Supported several important devices like Ethernet, WiFi, SD Card, HDMI, CPU throttling by porting the whole bare metal driver framework Circle to ChCore. Supported several important applications like CPython, cURL, BinUtils, ZLib, Lighttpd by enhancing the POSIX compatibility.
- **Adaptive System Modules.** Designed and implemented a new type of system extensions called Adaptive System Modules (ASM). Different from kernel extensions, user-level services and applications, ASMs can execute in either kernel space or user space, decided by user during loading time, providing flexible tradeoff between performance and safety.
- **Build System and Package Manager.** Rewrote the whole build system in modern CMake, designed and implemented the ChPM package management system. These work significantly improved the development workflow.
- **Virtualization.** Implemented the Raspberry Pi 3 support and ARM GIC hardware virtualization support for the ChCore hypervisor and virtual machine manager.

Open Source Projects

CQHTTP (~1.8k stars) 2017/1 – 2020/8
Author, Maintainer (C++17)
Created CQHTTP, an RPC plugin for a chatbot platform which only provided native APIs, to allow receiving and sending messages over HTTP or WebSocket, enabling developers to easily write chatbots in languages like Python and Node.js. In its prime, 5000 chatbots were powered by CQHTTP, and these chatbots were used by millions of users, by estimate. The RPC APIs became one of the de facto standards in its area.

CoolQ C++ SDK 2017/5 – 2020/6
Author, Maintainer (C++17)
Created CoolQ C++ SDK, a C++ chatbot SDK that was designed to provide modern C++ interfaces and elegant devel-

oper experience by utilizing features like type traits, SFINAE, smart pointers and constexpr. It was at first extracted from CQHTTP and later became an independent project that helped many developers to learn modern C++.

NoneBot (~2.1k stars) 2016/12 – 2021/8

Author, Core Maintainer (Python)

Created NoneBot, a chatbot application framework designed to be used together with CQHTTP. The easy-to-use APIs of NoneBot helped many people get started in programming. I also taught freshmen Python with NoneBot in Changzhou University, and mentored 3 students in the Open Source Promotion Plan (OSPP) 2021, a program similar to GSoC.

Talks

Modern CMake By Example 2021/11

A step-by-step tutorial talk given at Institute of Parallel and Distributed Systems, teaching new-coming master students and PhD candidates how to use CMake. It is indexed by the cs-self-learning project.

Why Write OS In Rust? 2021/7

A talk given at Institute of Parallel and Distributed Systems, sharing Rust features that can benefit OS development.

Skills

Programming Languages: Rust (Proficient), C++ & CMake (Proficient), Python (Proficient), Shell, Golang, Node.js, Java
Industry Knowledge: Stream Processing, Database Systems, Operating Systems, ARM64 Architecture
Spoken Languages: Mandarin Chinese (Native), English (Proficient)