Kaining Zhong

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EDUCATION

University of Illinois, Urbana Champaign - *Computer Engineering, MEng.* Aug. 2022 – May. 2024

The Chinese University of Hong Kong - *Computer Science, BEng.* Aug. 2017 – May. 2021

SKILLS

Programming languages: C++, Python, Golang, Rust, TypeScript, Java, SQL

Tools: Linux, AWS, LLVM, Bazel, Git, GitHub, Relational DBMS, Xcode, Docker, Kubernetes, CUDA, PyTorch, Ray

Work Experience

Tesla - *Software Development Engineer Intern, Vehicle Software* Augest. 2023 – Current

Mobile Engineering Infra Docker, Linux, Jenkins, GitHub Enterprise

- Build Tesla Android APP's GitHub CI/CD workflows on self-hosted Linux servers using Docker. Optimized CI/CD automation efficiency by parallelizing GitHub build jobs, and setting up Gradle & sccache caching server to speed up compilation process.

Amazon - *Software Development Engineer Intern, AWS CloudFront* May. 2023 – August. 2023

Control Plane - Realtime Logging Java, C++, AWS Kinesis, AWS EC2, AWS CloudWatch

- Developed, tested and deployed an integral component of AWS CloudFront's realtime metrics monitoring system, focusing on **leveraging Google FlatBuffers to serialize realtime metrics** collected from CloudFront's Nginx & Squid caching servers, and **utilizing zstd to compress serialized binary byte stream**, which 48% size of serialized data stored on Kinesis
- Employed AWS C++ SDK to feed data on realtime metrics processing cluster io **AWS Kinesis streaming system**, and employed AWS Java SDK to consume realtime metrics and display it on **AWS CloudWatch monitoring service**.

TikTok - *Software Development Engineer, iOS Infrastructure* July. 2021 – July. 2022

LLVM Compiler Infrastructure & Xcode Toolchain C++, Xcode, FaaS, Object Storage

- Improved Xcode debugging experience by optimizing Apple's LLDB, and deployed Xcode toolchain bundled with customized LLDB to multiple iOS APP's development team, **reducing initialization time for debugging from 200s to 30s**
- Fixed bugs for LLVM's LLD linker and migrated from Apple's LD64 linker to LLD linker, enabling faster linking for iOS applications including Lark & Toutiao; **reducing linking time from 120s to 60s in average**.
- Implemented a LLDB performance analyzing tool by dynamically rebinding exposed C++ Script Bridge API symbols in LLDB bundled in Xcode, reporting statistics such as time for loading images, variable evaluation, etc.
- Maintained a backend service implemented by **ByteFaaS serverless** that managed Xcode toolchains compiled from internal fork of Apple's Swift repository, using TOS as Object Storage Service to store toolchains.

Bazel Build System Bazel, Xcode

- Collaborated in migrating TikTok and TouTiao's build system from xcodebuild to Bazel and transformed the overall project structure to monorepo, **reducing building time from 11min to 6min on average**.

PROJECTS

Needle, a PyTorch-like deep learning framework Python, C++, CUDA

- Implemented a PyTorch style deep learning framework with components including **dynamic computation graph, backward automatic differentiation, dataloader, optimizer, some widely used neural network modules, and backend operators including a img2col optimized convolution operator supported by C++ and CUDA**.
- Trained ResNet9 model on CIFAR-10 dataset, and LSTM model on Penn Treebank dataset entirely relying on Needle framework.

Bustub, a Relational Disk Based Database C++, GTest, SQL, Relational DBMS

- Implemented a **concurrent B+ tree index** for faster data retrieval, which supports high concurrency access using latch crabbing to avoid unnecessary multi-thread synchronization, along with a **buffer pool manager** using **extendible hash table** and **LRU replacement policy**.
- Implemented **volcano model operators** that execute SQL query plans, supporting a subset of SQL syntax including sorting, joining and aggregation.
- Implemented a **transaction manager to support concurrent SQL queries**, which supports isolation levels up to Repeatable Read, along with a **deadlock detector** that aborts transaction when deadlocks are detected.

Distributed, Fault-tolerant KV NoSql Database Golang, Raft, RPC

- Built a fault-tolerant Key-Value NoSQL database **based on Raft consensus algorithm** using Golang's concurrency & RPC packages, supporting Put, Get, Append operations, and guaranteeing **Consistency & Partition tolerance**.
- Implemented optimizations including fast log recovery and **Snapshot persistence mechanism**.