Mitesh Kumar

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Skills

Tools C++, Python, Linux

Concepts Distributed Systems, Networking

Experience

Citadel Securities **August 2022 – Ongoing**
Software Engineer *Software Order Routing Team*

Product: Equities and Futures Software Order Gateway (EFSGW)

- Completely redesigned the throttled client cancel scheduler to meet the scalability demands of our US Equities clients. Designed smart and complex integration tests that stressed all production kinematics of the system. This is one of the fundamental features needed to allow passive strategies to route through the EFSGW as they have the heaviest cancel throughput. This additionally lead to major session cost savings as we no longer need enough sessions to handle peak cancel bandwidth for passive orders.
- Delivered 80% improvement in ETF Market-Making order marking variance by implementing an "Accumulated" marking refinement on EFSGW in the existing threading architecture where the out-path and local accounting of position are updated asynchronously. This required very deep intuition and understanding of the system architecture and concurrency model as well as all of the lock-free optimizations at play in the existing banded risk check library that the EFSGW leverages. I wrote extensive integration tests which involved minor refactorings of the EFSGW mock client fixture to enable sending orders at a high enough rate to trigger a behavior difference between Accumulated vs non-Accumulated marking. I built an order marking simulation to evaluate accuracy in a historical order traffic replay which gave confidence prior-to production rollout.
- Diagnosed and corrected timestamp bug in onload epoll abstraction which caused causal events to appear to be chronologically re-ordered
- Implemented binary order entry protocols for 5 venues in software for EFSGW clients. Heavy use of templating to produce a fast connection handler that is generalizable for future spec upgrades. Examined TCP captures to fend off allegations of memory corruption in our code from certain exchanges. Each of these requires extensive developer-orchestrated testing and quality assurance
- Delivered the first support for spread trading through the Software Order Gateway. Involved integration testing and improvement of spread-specific risk checks, and design of internal messaging layout and processing to ensure recoverability during disaster scenarios. Implemented robust transformation of symbol reference data sources to optimal data structures in the exchange connection handler.
- Implemented the first yield-spread-based trading at the firm in a low latency context. Involved risk check tweaking to support inverted price space.
- Improved robustness of system-generated order cancel trigger. Required some understanding of system architecture and concurrency model.
- Helped architect and maintain EFSGW's integration testing infra. Utilized event queue model to allow real-time output generated by different systems to be cross-reconciled without having to explicitly define a dependency graph among the components.
- Devised several strategic integration testing infra solutions to improve test run times, reliability (anti-flakiness), and coverage of important kinematics of the system.
- Solved several challenging bugs and race conditions in legacy exchange connectivity code
- Core development work for satisfying market making obligation on crypto exchange EDX Markets
- Implemented connection application-layer traffic inactivity monitor abstraction and rolled out to all 50+ exchange connection implementations
- Greatly decreased call stack complexity of system-generated cancel and decoupled it from client connection managing utilities to pave the way to support direct exchange connections via EFSGW's exchange connection template library.
- Implemented Max Order Cancellation attempt risk check on EFSGW

Susquehanna International Group **Jun 2021 – Aug 2021**
Software Engineer Intern *Algorithmic Predictive Execution Team*

Western Digital **Sep 2020 – Dec 2020**
Firmware Engineer Intern *Hard Disk Drive Firmware Development*

Education

Rensselaer Polytechnic Institute **2018 - 2022**
B.S. Computer Science, B.S. Computer Engineering
GPA: 3.97 *Distributed System Algorithms, Operating Systems, Machine Learning, Parallel Programming, Linear Algebra*