Using Programmable Switches to Aggregate Financial Data

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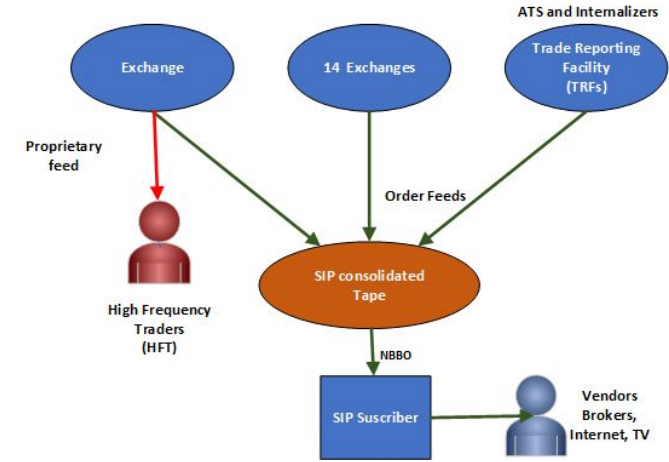
To ensure that stock markets are fair, the SEC requires brokers and market makers to buy/sell stocks to the public at the National Best Bid/Offer (NBBO) price. This price is determined by going through every exchange and picking the best price throughout the nation. You can think of this like the SEC is requiring all grocery stores (brokers) to sell apples (stocks) at the cheapest price offered by any apply farm. Aggregating all of these orders and finding this NBBO takes time, but the current methods are too slow (on the order of 10 microseconds, while some trading strategies run at less than 1 microsecond). Furthermore, companies, like Citadel, have been caught taking advantage of this delay in NBBO price by aggregating the actual best price faster (FastFill algorithm).

Programmable switches are a new computing device that can run certain algorithms extremely fast. This tech has been used by researchers to speed up databases and machine learning training. Our goal is to use programmable switches to digest financial data and output aggregated prices like the NBBO. If the NBBO can be calculated with less delay, the public will have fairer access to the most recent market data.

How the NBBO is made



Source: https://www.researchgate.net/publication/325888304_Big_Data_Framework_for_Finding_Patterns_in_Multi-market_Trading_Data

A programmable switch: Intel Tofino 2

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Through this research program, firstly, I got the chance to work on this really interesting project that looks to apply the most cutting edge computing technology to a new area for most CS academics. I learned so much about designing switch programs, how to think about developing for hardware, and, most importantly, the most important questions and problems facing the CS field. Designing the switch system taught me lots of cool tricks and ideas to write efficient code, and reading and discussing the most cutting edge projects in CS with professional researchers expanded my view on how CS will develop in the future.

Secondly, I gained so much exposure to a wide variety of fields. From talking with my peers also in the research program and listening to lectures by Harvard professors introducing their research, I learned so much about what the cutting edge of Medicine, Physics, and Quantum Computing looks like. I have no doubt that the knowledge I have gained through this summer research experience will shape my future projects and ideas.