IPRO 313: Ultra-High-Speed Market Data Ticker System

Introduction
Main objective
- Research and design a solution for our sponsor which sustains an optimal throughput of three million price quotes per second and minimizes latency while maintaining specific constraints.

Approach
- Research low latency discussions and reports
- Explore competitors’ solutions
- Develop a functioning ticker plant system
- Determine hardware requirements
- Benchmarks & Prototype

Townsend Analytics
- A direct-access trading system vendor, provides a real-time database management solution but according to predicted market data for the near future, their solution won’t stand ground for too long.

Problem Addressed
With the dawn of every new year, the speed of business is ever increasing.
- What used to be performed in months, days or minutes, is now being done in milliseconds; and even that is not fast enough!
- Businesses will have to transition to real time data management to keep a competitive drive on the market.

Within one second, between 5,000 and 30,000 are expected to occur on a real-time database system.
- Within a year, terabytes of data are expected to occur on a real-time database system.

In order for a business to upgrade, a unique system has to be prepared to handle:
- Large volumes of data
- Very frequent requests for data
- Increased rate of change of data

Methodology

Testing Different Hashing Algorithms
- Performance: Dense > Sparse > STL
- Memory usage: Sparse > STL > Dense
- STL: Table size and the character length has impact on the performance
- Sparse, Dense: Character length has impact on the performance but less impact from the table size

Performance can be improved by optimizing the algorithm of the container and the hash function

System Testing - Benchmarks & Results

Performance testing of various hashing algorithms on the system
- Bandwidth of our network equipment limited to 100 Mbps:
  - Need to find ways to increase bandwidth limit

Hardware Requirements
Defining Terms
- Feeds: Options, Stocks, Futures
- Feed Handlers: Translates incoming data to an internal format
- Data Cache: Stores old files
- Access Control: Handles client connections and permissions

General Architecture
Proposed Architecture

COMPETITOR SOLUTIONS

Future Work

Hardware
- Work around network bandwidth limit
- Implement proposed architecture
- Running tests on PlayStation 3 cell processors

Software
- Introducing efficient hash functions such as SuperfastHash and CRC32
- Implementing threads and parallel processing into code

Sponsor: Townsend Analytics