intel®

High Performance for Big Data

Kx Systems' kdb+ database provides major performance improvements utilizing Intel® Solid State Drive Data Center P3700 Series and the Intel® Xeon® processor E7-8890.

"From the outset, we have designed our products in anticipation of vast increases in data volumes. It has always been our philosophy to make the most efficient use of existing hardware and to build in sufficient redundancy and flexibility going forward."

Arthur Whitney
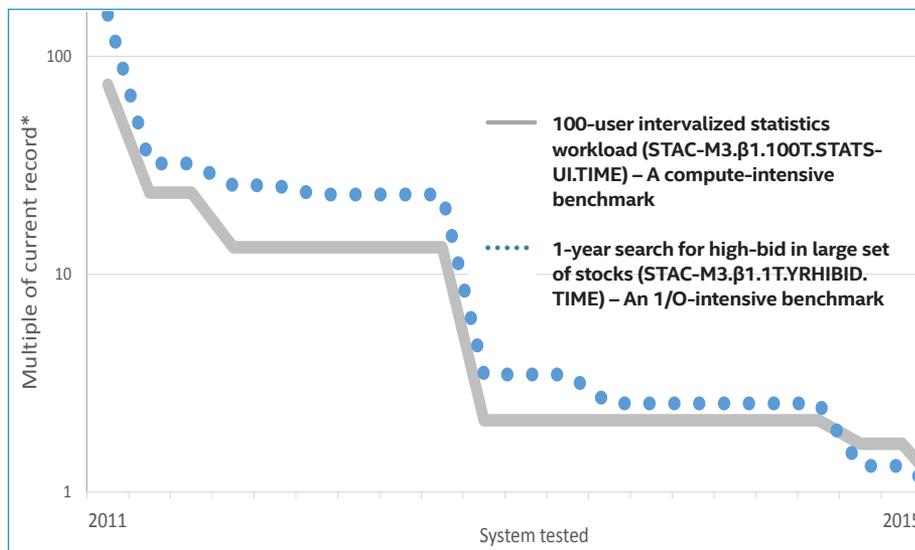Chairman and Co-founder Kx Systems

Over the past decade, the financial services industry has been a pioneer in developing complex analytics for vast quantities of streaming data as a necessary means of addressing an explosion in market data volume. The ability to analyze streaming data in the context of real-time and historical data has become essential. Today, many more industries are feeling the same pressure.

In striving to get the most from their growing data, many businesses have pushed their hardware and software systems to the limits of their performance. For businesses that rely on legacy infrastructure to manage vast amounts of streaming, real-time, and historical Big Data workloads, performance can plateau to the point of delaying crucial insights and dulling their competitive edge. Staying informed, compliant, and ready to act at the speed of business demands a multifaceted solution.

From exercise wearables to electric utility meters, the desire to track and measure daily life is driving innovation at an amazing rate. As these devices further connect our lives to broaden the Internet of Things (IoT), time-stamped — or time-series — data is being created in more locations at unprecedented rates. As some may have expected, to analyze streaming and historical sensor data creates challenges that mirror those presented by financial markets.

Intel and Kx Systems: Setting the Standard for Time-Series Analytics

Over the past decade, Kx Systems and Intel have set a high standard for speed and performance, beginning with the financial services industry, as market data volumes have soared. This leadership position has been documented over the years through audited benchmarking using Intel hardware running Kx's columnar database platform, kdb+.[1]

With its built-in programming language, q, kdb+ has been used by top investment banks for decades in the most challenging, time-sensitive applications. Column-store databases are generally recognized to be orders of magnitude faster than relational database management systems

Faster Response Time Using kdb+ on Intel Architecture for Two of the STAC-M3™ Benchmarks[1]

Legend:
— **100-user intervalized statistics workload (STAC-M3.β1.100T.STATS-UI.TIME) – A compute-intensive benchmark**

⋯ **1-year search for high-bid in large set of stocks (STAC-M3.β1.1T.YRHIBID.TIME) – An 1/O-intensive benchmark**

Y-axis: Multiple of current record*
X-axis: System tested (2011 to 2015)

* Y values represent the record as of each system tested, represented as a multiple of the current all-time record as of 22 June 2015. If a system did not achieve a new record, the Y value does not change. Log scale: lower is better. Source: STAC

(RDBMS). In particular, a time-series columnar database such as kdb+ is particularly well-suited for the performance and flexibility required by Wall Street.

Industries beyond finance are utilizing kdb+ to address their Big Data challenges because of its small footprint and flexibility. Kdb+ offers a simple, powerful, and efficient in-memory and on-disk columnar database that is ideal for time-series data, making kdb+ an appealing solution in other verticals, including pharmaceuticals, energy exploration, and critical infrastructure. For instance, the ease of integration with state-of-the-art user interfaces using kdb+'s built-in, high-performance WebSocket server implementation enables faster, more responsive visualization tools than ever before.

Better Together: Evolving Hardware and Software in Concert

Kdb+ was designed from the start anticipating Big Data volumes and the development of large memory, massively-parallel servers. Intel-based servers evolved from single core to multi-core CPUs with vector processing to meet the ever-growing compute demands of industry. At one time, 512GB of RAM was only an aspiration, while most financial services companies struggled with data sets that needed to run in 64GB of memory or less.

Today, server platforms are delivering systems with large memory volumes, some up to 12 terabytes, allowing Kx users to see their query results even faster. Intel continues to extend its support for vector instructions in its hardware to drive performance improvements, and Kx's array programming language, q, is an excellent fit with these designs. As Intel has added cores, threads, and vectors, customers have been able to easily utilize them through kdb+ by exploiting the parallelism of the platform, which manages the complexity of these architectures "under the hood", allowing even minimally-experienced programmers to get up and running quickly.

Over the last five years, Intel and Kx have submitted numerous solution designs for independent benchmarking against standards defined by user firms in the STAC Benchmark Council. The results of these tests have improved year-over-year due to enhancements in Intel architecture, disk storage technology, and kdb+. The use of vector instructions by Intel, along with increases in core count and memory, have required very fast storage to provide data to the compute engine. Intel SSD technology, beginning with the 320, followed by the DC S3700, and most recently the DC P3700, has greatly increased IOPS and reduced storage latency. Furthermore, kdb+'s built-in array programming language, q, makes full use of additional cores and vector instructions.

> **The combined impact of increasing cores, memory size, and speed by utilizing Intel® Solid State Drive DC P3700 Series SSDs, Intel® Xeon® processor E7-8890, and the latest Kx kdb+ database benchmarks has provided a greater than 100x performance improvement.**

To learn more about Intel SSD DC P3700 Series, visit **http://www.intel.com/content/www/us/en/solid-state-drives/solid-state-drives-dc-p3700-series.html**

To learn more about Kx's kdb+ database, visit **www.kx.com**

To learn more about the performance evolution of the kdb+ database on the STAC-M3 benchmark suites, visit **www.STACresearch.com**