



Multi-Core Leadership: the way forward for analyzing high-volume, time-critical data from unlimited market sources

Industry

Financial Services

Business Challenge

Handle exponentially growing volumes of financial market data while meeting the need for real-time database analysis of millions of streaming and historical records

Technology Solution

kdb+tick from Kx Systems

Enterprise Hardware Platform

Scalable Intel® Xeon® processor 5500 series-based servers

SOLUTION ARCHITECTS



MEETING NEW MARKET DEMANDS

The kdb+tick solution from Kx Systems is a robust, ultra high-speed database designed to capture and analyze millions of streaming market ticks for immediate real-time analysis. Used globally by trading groups at leading banks, brokers, hedge funds, asset managers, exchanges and other financial institutions, kdb+tick captures streaming data from numerous sources and analyzes it at real-time speeds for program trading and other real-time operations. The solution also stores the data so it can be used for back testing trading strategies and performing large scale trend analysis. kdb+tick is ideal for time-critical applications such as proprietary trading, real-time risk management and regulatory compliance.

The kdb+tick solution relies on Intel® Xeon® processor 5500 series-based servers (Nehalem) to deliver the high message rates and fast response times needed to analyze massive flows of streaming data. Based on the advanced Intel Core™ microarchitecture, quad-core Intel Xeon processors bring higher performance along with reduced power consumption and heat production for the ultimate in powerful, dense, energy-efficient servers. Their breakthrough capabilities provide the computing horsepower to support ultra high-speed database updates and searches. The Intel® Quick Path Interconnect, which provides point-to-point high speed links to distributed shared memory, dramatically reduces latency and increases memory bandwidth to feed the high-performance Intel Xeon processor 5500 series, delivering a greater than 50% reduction in the time required to process the benchmarks when compared to Intel Xeon processor 5400 series (see <http://www.intel.com/performance/server/xeon/summary.htm>).

THE BUSINESS CHALLENGE

Today's financial institutions collect market data from numerous exchanges and other sources worldwide. As more and more transactions are conducted electronically the volume of data is increasing to millions and even billions of records per day. Architectures and databases designed to manage data on 32-bit operating systems now struggle to handle the volume, the volatility and the pace. Analyses of large quantities of streaming data captured from a real-time market feed can easily outstrip the memory capacity of a 32-bit processor. Harnessing the future-proofed power of 64-bit multi-core architecture is the logical route to meet increasingly demanding data analysis requirements.

NYSE TAQ trading volumes 1994 - 2008

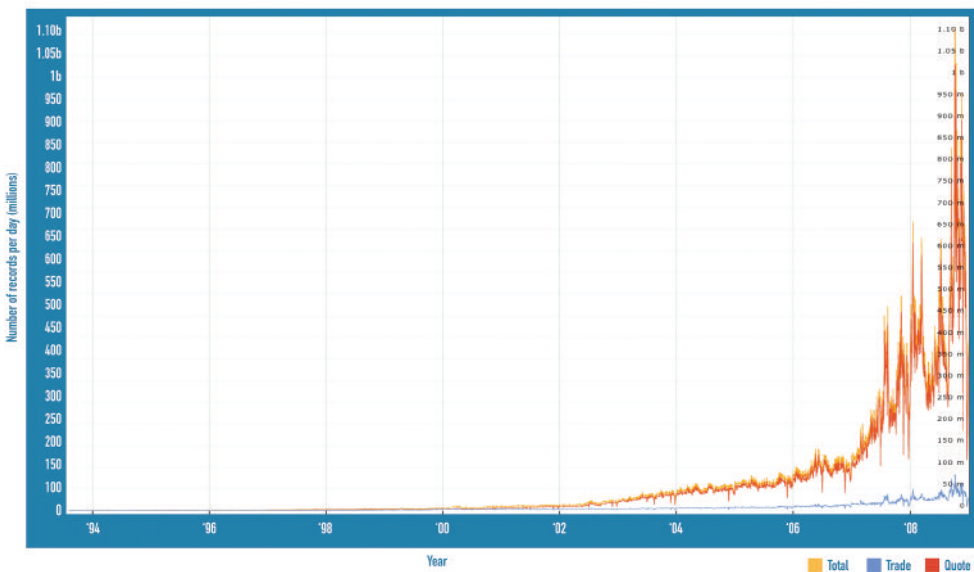


Figure 1. New York Stock Exchange Trade and Quote volumes have driven trading volumes to nearly double in the past year alone. Source: NYSE

Traditionally, streaming data has been discarded as memory capacity is reached, but discarding data is no longer acceptable for firms that want to establish and maintain an exemplary competitive advantage. Financial institutions need to analyze streaming data and save it to the in-memory database and to history so they can perform sophisticated mining of the data to develop competitive trading strategies. In addition, there is a requirement to compare streaming data to historical patterns, such as in evaluating risk management decisions in real-time, a compute-intensive application that will quickly overburden traditional in-memory databases. With existing market regulations, such as RegNMS and MiFID, and expected new regulations, financial institutions are being required to store many years of raw historical data.

Most financial institutions have already made substantial investments in technology. A critical issue is extending the value of legacy applications and data without enormous investment in integration time and complexity. The kdb+tick solution running on Intel Xeon processor 5500 series-based servers provides a seamless path from 32-bit to 64-bit multi-core computing and offers trading departments the horsepower to meet future challenges efficiently in data analysis even as they continue to use existing legacy infrastructures.

THE SOLUTION OVERVIEW

The kdb+tick solution captures, analyzes and manages billions of streaming ticks per day, as well as terabytes of historical tick data – and produces analysis results in real-time. It enables users to insert, update and query data coming directly from any data stream, whether exchange, in-house or vendor sourced, and has the capacity to handle unusual peaks in trading volumes that might be caused, for example, by unexpected major events. The volume of trades and quotes being processed by institutions has seen near exponential growth for a number of years, with no signs of slowing, as well as increased volatility which causes data peaks, putting an additional strain on systems. The kdb+tick solution enables trading groups to implement sophisticated trading strategies in real time no matter how much the volumes of data increase or fluctuate, with the ability to capture more than one million messages per second.

In handling such a large number of inserts per second kdb+tick also delivers the headroom to go far beyond simply capturing and updating market data. For example, it can simultaneously support many thousands of real-time custom queries, proprietary analyses on data in-memory, update database indices dynamically to speed query execution, and log data to the file system.

Once saved to disk massive amounts of kdb+tick data can be queried at speeds of ten million records or more per second per processor. Saving streaming data allows firms to test their strategies and mine market data history for the trading intelligence that creates a competitive advantage.

TECHNOLOGY

The kdb+tick solution features the following technologies:

- **Application architecture.** The kdb+tick solution is a tick data capture application layered on the Kx Systems kdb+ database. The database includes a high-level programming language designed to work with time-series data. It also provides interoperability with other databases and open interfaces to C, C++, Java* and .Net* applications.
- **Hardware and software architecture.** The kdb+tick solution runs on servers with the latest Intel Xeon processor family (64-bit, quad-core) using Linux*, Mac OS X*, Solaris* and Microsoft Windows* operating systems.

- Servers based on the quad-core Intel Xeon processor 5500 series, with its high speed and large cache, are well suited to handle the transaction volumes and the sophisticated analysis requirements that applications such as kdb+tick facilitate. Intel Xeon processors built on Intel Core microarchitecture also feature Intel® Intelligent Power Capability to manage the runtime power consumption of all the processor's execution cores, resulting in excellent energy optimization. The Intel Quick Path Interconnect optimized multi-core caches significantly reduce data latency, improving performance and efficiency.

BENEFITS OF THE SOLUTION

The kdb+tick solution is designed for and being used by financial services firms worldwide, including global banks, central banks, exchanges, regulators, asset managers, insurance companies, hedge funds and pension funds. It is designed to meet the needs of trading directors who depend on capturing all of the data all of the time. It performs sophisticated analysis on large volumes of in-memory and historical data, offering institutions key competitive advantages.

CUSTOMERS

Please see <http://kx.com/customers/> for a list of some Kx customers using the kdb+ tick solution.

SOLUTION FUNCTIONALITY

The benefits provided by the kdb+tick solution include:

- Ease of installation and programming. The kdb+tick solution can deliver production applications within 24 hours of installation and provides a fast return on investment (ROI).
- Integrated streaming, real-time and historical data. The kdb+tick solution supports queries against streaming, real-time or historical data, or a combination of any of these.
- Fast data capture and analysis even as data volumes continue to rise.
- The kdb+tick solution provides a scalable path for growth and a rapid ROI.
- Multithreading capabilities – because multithreading capabilities are embedded in the kdb+tick solution developers can take advantage of parallel processing without changing their code.
- Scalability – the kdb+tick solution provides virtually unlimited room to grow with short- and long-term profitability requirements, helping to lower total cost of ownership (TCO).
- Compatibility with legacy technologies.
- Cloud computing – this may provide significant opportunities for customers and the combined Intel/Kx solution provides an efficient method of utilising the power of the cloud.
- Optimized energy efficiency – The kdb+tick solution is performance tuned for the Intel Xeon processor 5500 series which automatically and intelligently adjusts server performance according to application needs. You get maximum performance when needed and gain big energy savings when you don't.

FUNCTIONAL BUSINESS CONCEPT

The kdb+tick solution combines streaming, in-memory and on-disk data into a single database for purposes of analysis. Users can set up as many data services as are relevant to their trading department functions and provide those data services to an unlimited number of application clients. Streaming real-time data from market feeds is saved in-memory to the real-time database, and is logged and saved to history. Users can query the real-time database, the historical database or the combined database as needed to support a variety of trading, risk management and compliance/regulatory applications.

SOFTWARE ARCHITECTURE

The kdb+tick solution is a tick data capture application layered on the kdb+ database. The database includes a high-level programming language designed to work with time-series data. In addition it provides interoperability with other databases and open interfaces to C, C++, Java and .Net applications.

The kdb+ architecture unifies streaming, in-memory and historical data

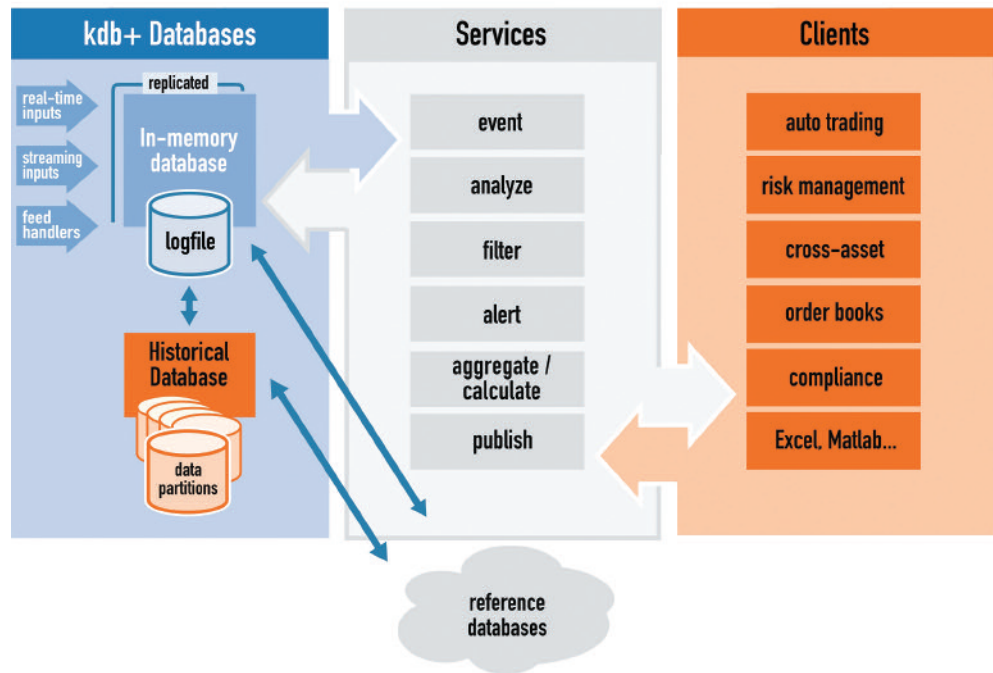


Figure 2. The kdb+tick solution combines streaming, in-memory and on-disk data into a single database for the purposes of analysis. Users can set up as many data services as are relevant to their trading department functions and they can provide those data services to unlimited application clients.

SYSTEM ARCHITECTURE

- Future scalability. Clusters, grids and, potentially, proprietary clouds are increasingly seen as solutions to large scale computing challenges, such as those which the kdb+tick solution addresses. Servers based on quad-core Intel Xeon processors are the clear choice for today's multiprocessor systems. Their ability to handle large quantities of memory makes them ideal for those computing environments. In addition, their included Intel® Virtualization Technology and unsurpassed virtualization headroom mean greater performance and higher solution ROI.

- Future-proofed. Unlike legacy systems the kdb+tick solution was designed from the outset for multi-core architectures, offering significant increases in speed over 32-bit systems. It also provides binary compatibility between 32-bit and 64-bit applications. The kdb+tick solution running on quad-core Intel Xeon processor-based servers provides a scalable path for growth and a fast ROI. As high performance multi-core servers increase in socket and core count kdb+ is well situated to take advantage of the additional processing power.

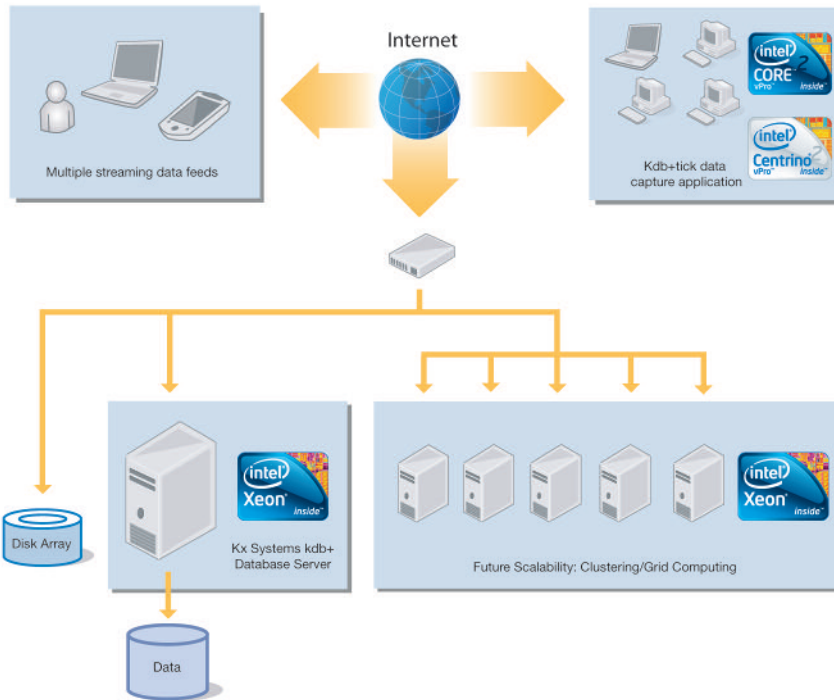


Figure 3. Example customer installation.

SUMMARY

To achieve and maintain a competitive advantage financial institutions are increasingly required to capture, analyze, store and manage huge volumes of both historical and real-time data to make time-critical investment and risk management decisions. The kdb+tick solution from Kx Systems running on Intel Xeon processor 5500 series-based servers is an ultra high-speed, scalable and open database solution tailored to meet these demands. The solution relies on the processing horsepower and fast memory access of the quad-core Intel Xeon processor to rapidly process massive quantities of data in real-time, providing excellent decision support. The solution can be easily integrated with other applications, and with legacy systems and applications, extending ROI and lowering TCO.

LEARN MORE ABOUT THE BENEFITS OF THIS INNOVATIVE SOLUTION

For general information about the products described in this solution blueprint, visit:

Kx Systems: <http://kx.com>

Intel Premier IT Professionals: <http://ipip.intel.com/go/fsi/>

If you have specific questions about implementing this solution within your organization, contact your Intel representative or contact Kx Systems at: info@kx.com or phone: +1 212 792 4230

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