SOLUTION BRIEF

Accelerating Electronic Trading

With exponential growth in market data volumes, financial firms are under great pressure to maintain efficiency in their electronic trading platforms. Systems are stretched to their limits.

Financial services—of which success is measured by system performance, latency, jitter, and trade execution time—operate in an environment in which a single millisecond of latency in the execution of trades can translate into millions of dollars in lost profits; thus it is crucial that the network not create any bottlenecks, which impede performance.

The pressure to maintain the lowest latency remains, while both internal and external sources demand transparency, and accountability. This means capabilities, such as time stamping data and monitoring trade acquisitions and statistics, must be built into the heart of any system without impacting latency, jitter and effective scaling.

Mellanox adapters and acceleration software deliver this performance on mainstream open source solutions and offer highly accurate sub-microsecond time synchronization, enabling financial firms to maximize their efficiency and return on investment.

HIGH PERFORMANCE ON MAINSTREAM PLATFORMS

Mellanox is the world's leading provider of high-speed Ethernet solutions, with 10/25/40/50/100GbE adapter cards and performance-enhancing messaging accelerator software. Unlike many other solution providers, Mellanox is committed to ensuring that its solutions meet the highest standards of interoperability and openness.

Mellanox adapter cards are available and supported by all mainstream OEM server platforms, and are fully interoperable with standard TCP/UDP/IP stacks. They are supported by all mainstream operating systems, including Windows, Linux distributions, VMware and Citrix XenServer, without requiring kernel modifications or proprietary drivers. This means that companies can implement trading solutions with their organization's standard hardware and operating system configurations, saving greatly on capital (Capex) and operational expenditures (Opex), and reducing the risk of security breaches.

Furthermore, Mellanox maintains its key software in the open source community, providing customers the freedom to implement an accelerator product and more easily tailor it to their specific application needs.

MELLANOX ADAPTER CARDS

Mellanox offers various adapter cards featuring exceedingly low latency and hardware-based RDMA technology that is perfect for meeting the needs of the financial services industry.

The ConnectX-4 Lx network controller is forward-thinking hardware, with 10/25/40/50GbE bandwidth, improving return on investment by providing more speed at lower cost per gigabit. This enables companies to sustain a competitive advantage without breaking the bank.

ConnectX-5 EN is Mellanox's latest addition to the ConnectX family, providing 10/25/40/50/100Gb/s bandwidth in a single port with up to two ports per adapter. Based on advanced technology providing sub-microsecond latency and a capacity of 200 million messages per second, ConnectX-5 EN offers the next generation of connectivity today.

VMA MESSAGING ACCELERATION SOFTWARE

Mellanox's Messaging Accelerator (VMA) transparently boosts performance for socket-based applications without having to modify the applications. By offloading network processing from the OS, traffic passes directly to the network adapter from the application user space, bypassing the kernel IP stack and minimizing context switches, buffer copies, and interrupts. The result is a reduction in latency by 500% and an increase in application throughput, as compared to applications running on a standard network kernel stack.

VMA is fully compliant with standard socket APIs and Ethernet/IP wire-protocols such as TCP, UDP and Multicast, making it a completely transparent solution to implement and run. It requires no application code changes, and there are no concerns about third-party interoperability.

VMA provides low latency of 1.2 microseconds for a TCP socket-based application and 1.0 microseconds for UDP. In addition, VMA delivers more than 4 million ingress multicast packets in a single thread.

For extreme applications with multiple connections, VMA version 8.4 adds a socket extension API named SocketXtreme. SocketXtreme brings latency down, eliminating copy operations and increasing throughput allowing applications to further utilize true kernel bypass architecture. SocketXtreme is an open source API without any associated license fees, and is already deployed in production.

HIGHLY ACCURATE TIME SYNCHRONIZATION

High frequency trading platforms require reliable and precise time synchronization to avoid millions of dollars in lost transactions. Mellanox adapters provide accurate hardware timestamps to a variety of Network Time Protocol (NTP) / Precision Time Protocol (PTP) client applications, which in turn guarantee global synchronization across trading platforms. Mellanox adapters support open source PTP clients, such as LinuxPTP and PTPd, and also integrate well with Timekeeper™ from FSMLabs for the most advanced accuracy and precision.

On Linux, PTP out-of-the-box uses information that the Mellanox adapter provides to factor out packet delay variation caused by buffering, network stacks, and OS scheduling, and automatically improves precision of locking the local timer to the reference time.

This ensures sub-microsecond time precision from the PTP, even over shared network links. For high quality links and time feeds, applications can see time locked to reference well within 500 nanoseconds of variation.

PERFORMANCE RESULTS

Mellanox solutions are proven to enable world-leading low latency financial data centers, including the world's largest stock exchanges, investment banks, and prop traders. Performance testing has shown Mellanox to have a significant advantage in reducing latency over the competition. Recent STAC Report unequivocally determines that compared to all other public reports tested, setup with Mellanox provides the lowest latency seen to date. See report on STAC Research site: https://stacresearch.com/HPE170814.

Figure 1 shows 25% lower latency of more than 400nsec when using Mellanox adapters for UDP Multicast compared to the competition.

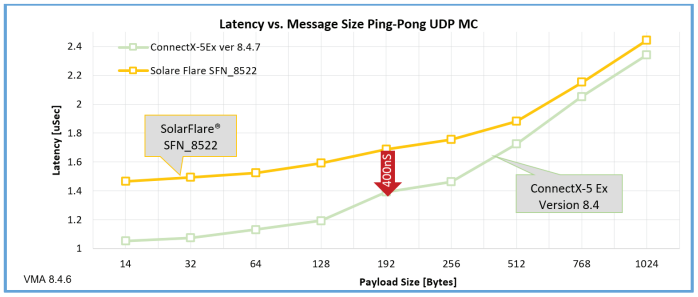

Figure 1: Ping-Pong Test of Latency vs. Message Size for UDP Multicast

Mellanox VMA maintains a 30% advantage over Solarflare OpenOnload for TCP communication as well, as seen in Figure 2.

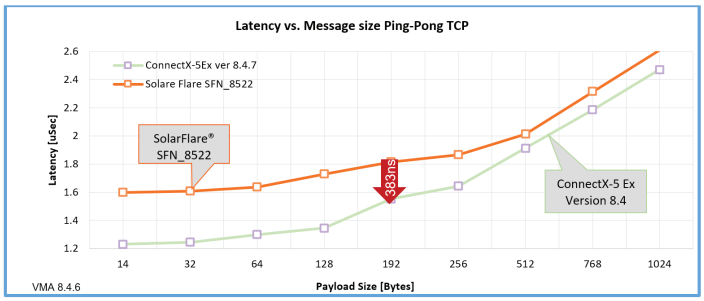

Figure 2: Ping-Pong Test of Latency vs. Message Size for TCP

Mellanox VMA offers the highest performing solution for latency-sensitive applications, such as high frequency trading. For applications requiring multiple connections SocketXtreme brings extra benefit and lower CPU utilization. Figure 3 demonstrates TCP latency vs number of connections.

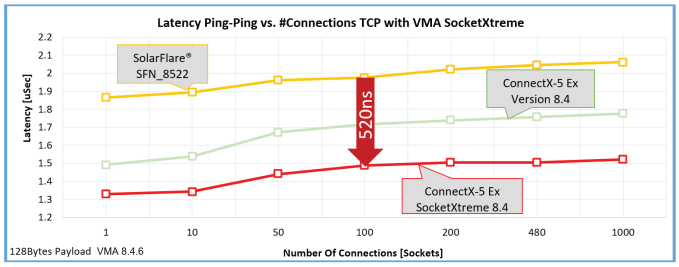

Figure 3: Ping-Pong Test of Latency vs. Number of TCP Connections Using SocketXtreme

SUMMARY

To compete in the world of electronic trading, solutions must run with the lowest possible latency and jitter, while providing the highest bandwidth and best return on investment. For a large array of investment banks, hedge funds, and exchanges around the world, Mellanox Ethernet solutions deliver a powerful combination of flexible, high-performing networking hardware and open source messaging acceleration software to meet the low latency and high throughput requirements of these high frequency trading environments.

Learn more about Mellanox's low-latency products by visiting:

- Mellanox VMA software (https://goo.gl/BG4uCY)
- Linux drivers for Mellanox adapter cards (http://goo.gl/XJpPG5)
- VMA performance tuning guide (https://goo.gl/fgJ6MA)
- Where to buy (https://www.mellanoxstore.com/categories/adapters/ethernet-cards.html)

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