



◆ APPLICATION NOTES:

THE IMPORTANCE OF TRANSCEIVERS TO TRADING FIRMS

Financial markets continue to advance in size, speed and complexity. This is true regardless of the financial instrument or commodity being traded. More than that, within the last decade there have been great advances in algorithmic trading strategies that require increasingly greater computing power. Most experts report that nearly 2/3rds of all trading across stock and commodity markets are driven by automated means. As pointed out by Sean Gourley, CEO of Quid, that with respect to the financial markets, we have entered the “world of the machines” when decisions and actions are made at in fractions of a second. In comparison high frequency traders today, in the world of market makers and arbitrage, are doing transactions in the sub-microsecond realm—more than a million times the strategic thought of a human. The advantages of this speed comes in the ability for the algorithms behind the trading to constantly look for, test and execute models based on direct information feeds and market trading. And the end result of this activity according to the Tabb Group is profit.

What are the top firms utilizing to drive these advances in trading speed? Advantages come in the form of software algorithms and hardware advances especially with respect to latency and throughput. Although many techniques utilized by these trading firms are proprietary, Anuj Agarwal of Capgemini summarized some of the high-level hardware strategies as follows:

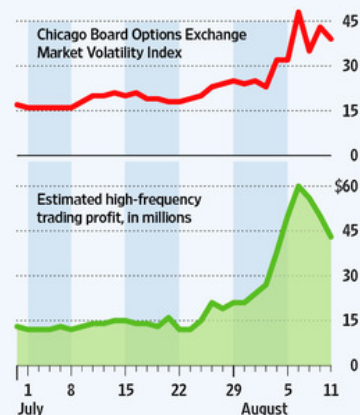
- 1. Fiber Optics** Utilization of advanced fiber transmission and shortest route layouts leads to a reduction in port-to-port communication time.
- 2. Bandwidth** The software algorithms require great volumes of data and these advances have been matched by higher transmission speeds of 10Gbs and 40Gbs, and now 100Gbs.

- 3. Field Programmable Gate Arrays (FPGAs)** FPGAs have been around for a long time, but only recently have they been used build custom hardware acceleration to augment and speed up specific functions in trade computing.
- 4. Multi-Core Processing** Modern multi-core processors allow parallel execution of algorithms. Utilizing and optimizing parallel computation improves system throughput and reduces overall compute time.
- 5. Co-Located Servers/Storage** Reduced physical distance, leads to shorter point-to-point connections, reduced latency and faster communications.
- 6. Raw Data Feeds** Traditionally data service vendors consolidated data across many sources to post on their feeds. This consolidation takes valuable time. Advanced trading firms purchase raw data feeds allowing them to more quickly analyze information that will impact their trading decisions.

Clearly there is much strategic thinking (see FIX'ing It on the next page) and effort put into improving data hardware platform performance in the trading industry. Beyond that, these specialized systems and techniques, along with the volume of compute, storage and network equipment needed leads to large financial outlays.

Speed Pays

The market's fastest-moving traders have seen their profits soar on days with high volatility, whether or not stock indexes ended up or down.



Source: Tabb Group



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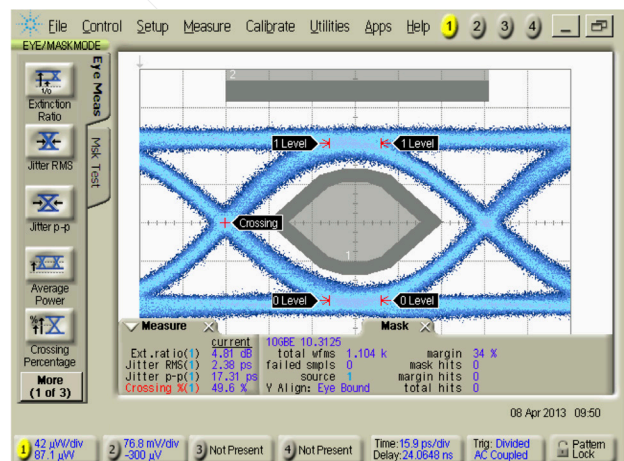
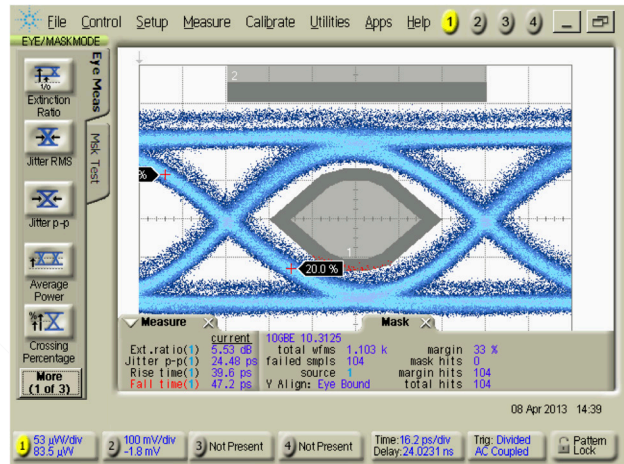
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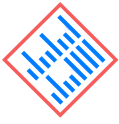
But one often-overlooked area of added bit errors, jitter and latency due to retransmissions happens in the optical realm. Transceivers are used to convert electrical data to optical signals for transport of the optical fiber routed inside and outside the data center. These devices are made up of both electrical and opto-electronic components and, just like other equipment in the network, transceivers come in different grades and specifications. There are some important reasons for IT professionals in the trading industry to examine their current usage of transceivers.

1. No OEM vendor manufacturers their optical transceivers. They subcontract this work.
2. OEM vendors are experts on their hardware and software, but they are not experts in optics or optical architectures.

3. OEM vendors view optics as a commodity and prove this by doing regular reverse auctions with their suppliers to get the lowest cost standard part.
4. OEM buying of transceivers is much like the auto industry. Automobile manufacturers, like data equipment OEMs, buy in low to medium-quality tires in bulk to lower cost. You will never get the highest performance tire on your new car and you will never get the highest performance transceiver from your OEM equipment vendor.
5. The above points combine to create a situation where the effort put forth so diligently to increase throughput and reduce latency could be lost by accepting run-of-the-mill transceivers from your OEM.

What is really happening on that fiber optic line? Well take a look at the two eye-diagrams to the right. In the left graphic you have a substandard transceiver. This transceiver exhibited bit errors and jitter during its testing. Data is being transmitted by this transceiver, but depending on the frequency and timing of the errors, it may be causing retransmissions and added latency to the data in your network. Now contrast the eye-diagram for the transceiver on the right. This transceiver is from InterOptic (IO) and exhibits "Tier 1" quality and performance. This zero bit error and perfect eye diagram behavior is what we seek out of all IO transceivers. This level is achieved by IO bringing the optical expertise of its team to bear working with our suppliers to achieve performance and quality beyond what you would receive from any OEM.

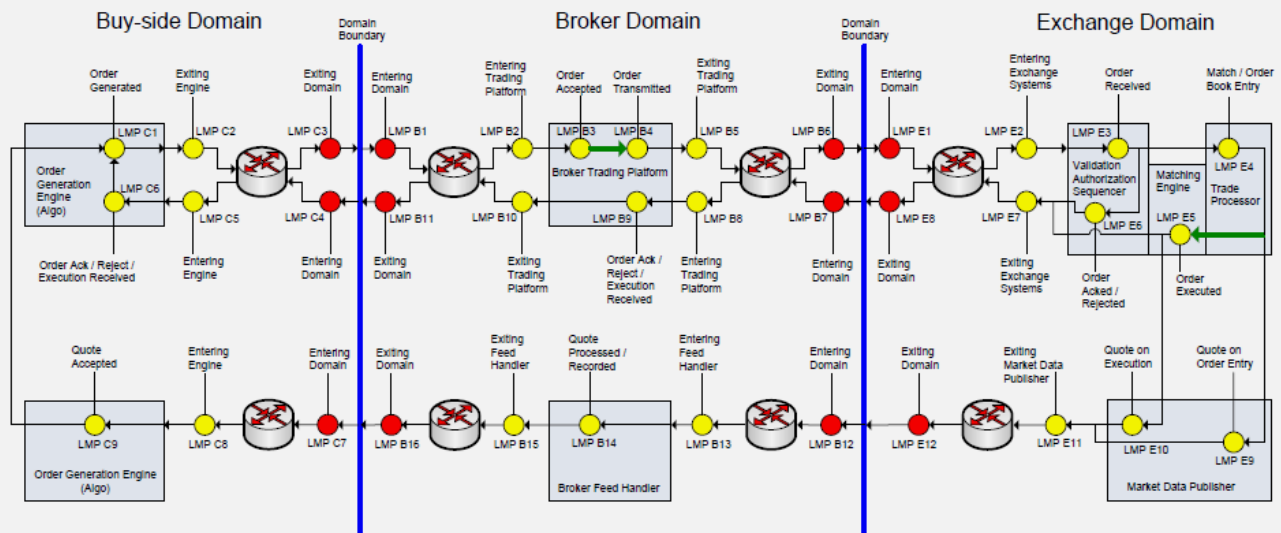




FIX'ING IT

◆ The Financial Information eXchange (FIX) Protocol is a non-proprietary, open source, electronic messaging standard, consisting of a series of messaging specifications for the real-time, electronic communication of securities transactions. The increasing popularity

of high frequency trading (HFT) has resulted in a FIX working group to address the need for latency standards in the industry. Ultimately, the goal is to make it easier for all HFT market participants to measure and exchange latency data.



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