InterOptic
By Advantage Optics

◆ **APPLICATION NOTES:**

THE IMPORTANCE OF OPTICAL TRANSCEIVERS TO TRADING FIRMS

Financial markets continue to advance in size, speed and complexity. Over the last decade, advances in algorithmic trading strategies require more and more computing power. Experts report that two-thirds or more of stock and commodity trading is driven by automation. Says Sean Gourley, CEO of Quid, we have entered a "world of machines" where decisions and actions are made in fractions of a second.
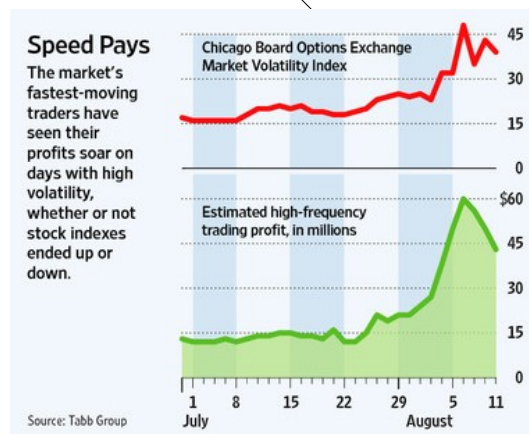
With the advantages of speed comes an ability for algorithms to constantly look for, test and execute models based on direct information feeds and market trading. The end result of these activities is profit.
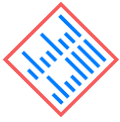
What do top firms use to drive advances in trading speed? New software algorithms and hardware advances lower latency and increase throughput. Although many trading techniques are proprietary, Anuj Agarwal of Capgemini summarized these high-level hardware strategies:

1. **Fiber Optics** Advanced fiber transmission and shortest route layouts reduce port-to-port communication time.

2. **Bandwidth** Software algorithm needs for great volumes of data are met by 10Gb, 40Gb and 100Gb transmission speeds.

3. **Field Programmable Gate Arrays** (FPGAs) now enable custom hardware acceleration to augment and speed up specific functions in trade computing.

4. **Multi-Core Processing** Modern multi-core processors enable parallel execution of algorithms. Parallel computation improves system throughput and reduces compute time.

5. **Co-Located Servers/Storage** Reduced physical distance leads to shorter point-to-point connections, less latency and faster communications.

6. **Raw Data Feeds** Traditionally, data service vendors consolidated data across many sources to post on their feeds. But consolidation consumes valuable time. Advanced trading firms purchase raw data feeds, enabling them to more quickly analyze information that impacts trading decisions.

Much strategic thinking (see FIX'ing IT below) and effort go into improving data hardware performance in the trading industry. Specialized systems and techniques, plus the volume of compute, storage and network equipment needed, equal 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.

Chicago Board Options Exchange Market Volatility Index

Estimated high-frequency trading profit, in millions

Source: Tabb Group

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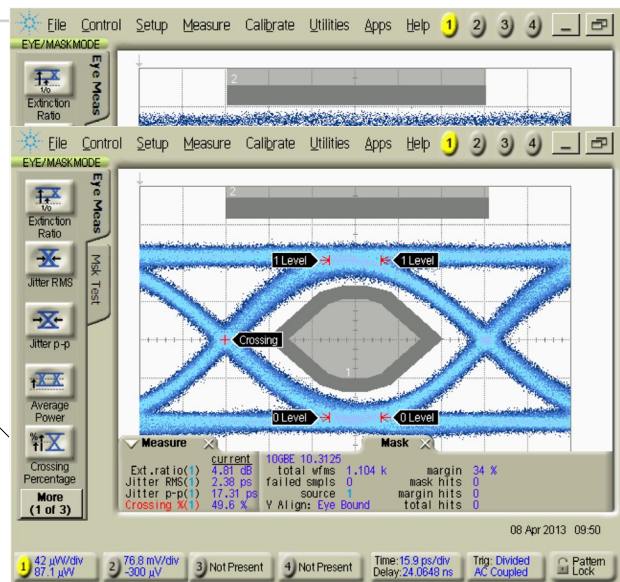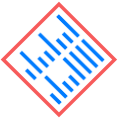## By Advantage Optics

One often-overlooked area that adds bit errors, jitter and latency due to retransmissions is the optical realm. Transceivers convert electrical data to optical signals for transport through fibers inside and outside the data center. These devices, made up of electrical and opto-electronic components, come in different grades and specifications. Here's why IT professionals in the trading industry need to examine their current use of transceivers.

1. No OEM vendor manufacturers optical transceivers. They subcontract this work.
2. OEM vendors are experts on their hardware and software, but not in optics or optical architectures.
3. OEM vendors view optics as a commodity, so they do regular reverse auctions with suppliers to get the lowest-cost standard parts.
4. OEMs' buying of transceivers is similar to the auto industry's tire purchases. Car manufacturers buy low- to medium-quality tires in bulk to lower costs. That's why you never get the highest-performance tire on a new car. Similarly, you don't get the highest performance transceivers from OEM vendors.
5. Diligent efforts by IT professionals to increase throughput and reduce latency can be undermined by the run-of-the-mill transceivers OEMs offer.

What is really happening inside a fiber optic line? Take a look at the two eye-diagrams on the right. In the first graphic you see a substandard transceiver that exhibits bit errors and jitter during testing. Although it transmits data, depending on the frequency and timing of the errors, it may cause retransmissions and add latency to the network. Now contrast that eye-diagram with the second one. This transceiver from InterOptic exhibits what we call "Tier 1" quality and performance. A zero bit error and perfect eye diagram behavior is what you should expect from all transceivers. InterOptic achieves this by combining our optical expertise with world-class suppliers to achieve performance and quality surpassing the OEMs.

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FIX'ING IT

◆ The Financial Information eXchange (FIX) Protocol is a non-proprietary, open source, electronic messaging standard. It consists of a series of messaging specifications for real-time, electronic communication of securities transactions. Increases in high frequency trading (HFT) led to a FIX working group to address latency standards in the industry. Ultimately, the goal is to make it easier for all HFT market participants to measure and exchange data on the latency of data.