



## Algo Speed High-Frequency Trading Solution

*Enabling Performance AND Reliability in Your Automated Trading - No Compromise*

### Summary

High-frequency trading (HFT) has become an important function within global financial markets. Trading volumes are on the rise and HFT is the largest contributor. Profits in HFT are currently estimated by the Tabb Group to be US\$21.8 billion per year. Speed is the most important differentiator in HFT, making it critical to establish the lowest possible latency between processing environments.

The demand for low-latency services has increased tremendously since the advent of algorithmic trading. Milliseconds and now microseconds are a competitive edge, both for the demand and the provision of electronic execution services. Speed is important to sophisticated market participants because it impacts the profitability of their innovative trading strategies. Equally critical is the ability to outperform competitors during peak periods of intense activity. These attributes require an agile and high-performing infrastructure that supports today's best-execution requirements and addresses the enormous volumes and surges of data associated with periods of market volatility.

Cisco has a proven track record of providing innovative solutions to leading firms in global financial markets. The Cisco® Algo Speed High-Frequency Trading solution is based on decades of experience and investment. This solution provides:

- A scalable architecture with predictable performance that adjusts to meet business requirements
- Proven low-latency and reliability supported by the most rigorous, real-world testing in the industry
- The capability to handle extremely volatile periods of market activity without loss—for instance, at market open and close or when mid-day opportunities generate intense surges of trading activity

### Challenges

High-frequency trading is a subset of the electronic, algorithmic trading market, exploiting very short-lived opportunities, especially during times of high volatility in the market. To optimize performance and minimize delays due to distance, many firms co-locate their servers at the execution venue. The effect of HFT on the market extends beyond the firms that focus on this practice.

To establish competitive differentiation and profit in this market, firms are focusing on the following business imperatives:

- Speed of execution
- Instant access to market data
- Ability to sustain peaks of activity

When peaks in traffic occur for a very short time (microseconds), they are called microbursts. A microburst can overwhelm a non-optimized network and cause transactions to be lost or require retransmission, which has significant negative impact on a firm's financial performance. It is not unusual for a microburst to exceed a firm's allocated network bandwidth or average link utilization by another degree of magnitude. Because of their transient nature, microbursts can go undetected if the monitoring tools are not granular enough.

The impact of microbursts on trading may be huge. What's more, based on projected volume increases in the markets, the frequency of occurrences is increasing. One packet of information dropped because of a microburst that exceeds the network bandwidth can dramatically increase trading time, requiring retransmissions and possibly resulting in complete data loss and therefore transaction loss. Since an HFT algorithm performs thousands of trades per second, every retransmission can translate into significant revenue loss. The challenge is to minimize trading latency end-to-end while handling peaks without packet loss.

## Solution Overview

Cisco's Algo Speed High-Frequency Trading (HFT) solution is part of the comprehensive Cisco High-Performance Trading (HPT) solution portfolio and integrated architecture, built to address the trading value chain from the front office to the back office.

Firms establish and maintain their competitive edge by continually evolving their trading strategies and increasing the speed of trading. This stresses technology architectures that are not agile enough to be easily managed and upgraded. An agile architecture, such as the Cisco architecture underpinning Cisco HPT solutions, integrates the latest technologies from both network and application domains. It is modular, scalable, and manageable, providing a path to evolve each component with minimal disruption to the overall architecture.

The Cisco Algo Speed HFT solution delivers robust network connectivity without packet loss. The solution is tested and optimized for speed with the messaging middleware, the latency monitoring, and the server network adapters from Cisco's rich ecosystem of partners. Built for HFT clients who have unique requirements for speed, reliability, agility, and manageability, the solution (Figure 1) includes the following:

- Cisco Nexus® 5000, 3000 and 2000 Series Switches: Designed to meet the stringent, low-latency requirements of data centers for next-generation financial markets, these switches deliver cost-effective scalability with a transport that can navigate the transition to 10 Gigabit Ethernet and unified fabric, while maintaining operational continuity for an environment where system availability is assumed and maintenance windows are rare, if not totally nonexistent.
- The Cisco Catalyst® 4900M Switch: An ideal solution for deployments that require high-performance services at wired-network speed, as well as high availability, and the modular flexibility to support Gigabit Ethernet, 10 Gigabit

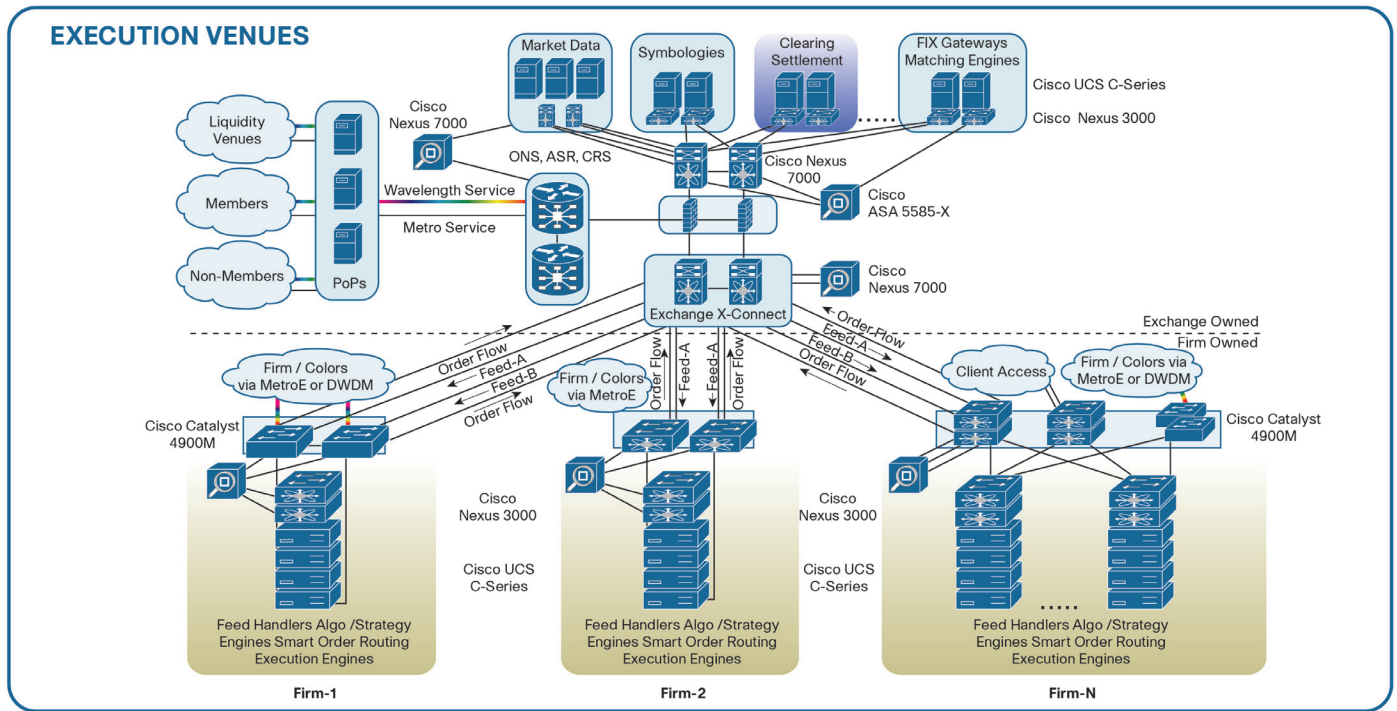


*"The dominant factor in determining whether or not a high-speed network had a latency problem was how 'bursty' the traffic was. In a gigabit local area network environment, for example, we saw that microbursts could result in large spikes of traffic that could induce upward of 500 milliseconds of delays."*

*- Donal Byrne, CEO  
Corvil*

*Corvil is the provider of the CorvilNet latency monitoring system, which detects microbursts and is used by many firms in the HFT business.*

Figure 1. Cisco Algo Speed Co-Location Architecture



Ethernet, and optical interfaces, all in a small form factor.

- Partner solution integration, including but not limited to:
  - Solace message routers
  - 29West (now part of Informatica) Latency Busters Messaging middleware
  - Thomson Reuters Market Data System (RMDS)
  - NYSE Technologies Data Fabric
  - Corvil CorvilNet for latency monitoring and microburst detection
  - Network adapters from Intel, Solarflare, and Chelsio

## Proven Performance

There are a few common misconceptions in the way networks are tested for HFT environments:

- The focus is often on nominal latency, without accounting for the latency impact of microbursts that frequently occur during periods of market volatility. Latency at scale is often not fully evaluated.
- End-to-end application performance is often not benchmarked. Benchmarking is often done only at a functional level.

The Cisco Algo Speed HFT solution has undergone exhaustive and comprehensive testing, not just in Request for Comments (RFC) scenarios, but also in real-world scenarios, including microbursts of traffic with varying market-realistic packet sizes. Unlike competing solutions, the Cisco switches included in the Cisco Algo Speed HFT solution are purposely designed to sustain peaks of traffic without loss. This type of testing puts significant stress on switches and emphasizes the need for an architecture that addresses both speed and appropriate buffer size to accommodate data peaks and volatility.

In a recent real-world performance test completed by [Miercom](#) (an independent, privately held network consultancy, specializing in networking and communications-related product testing and analysis), Cisco switches outperformed competitors and demonstrated the capability to provide ultra-low latency and also handle microbursts without loss. In contrast, the products of competitors dropped packets under relatively low microburst conditions. Cisco is committed to completing the most



*"Leveraging the latest technology advancements is among our core tenets. Selecting the Cisco Nexus 3064 switch was an obvious choice as our top-of-rack solution to take advantage of its 64-port 10Gbps density. Its ultra-low latency switching with robust layer-3 unicast and multicast routing features delivers the performance required by our most latency-sensitive clients, while maintaining upstream consistency with our Nexus 7000 core switches.*

*We are managing a significant growth in clients who are selecting us to provide ULL solutions in all of the major US data centers. As a result, we are looking for a provider that not only meets our performance requirements, but also offers a rich layer of functionality – such as private VLAN security without any latency penalty. Once again, Cisco has demonstrated their leadership."*

*- Victor Kokaram  
Head of Infrastructure*

comprehensive testing in the industry, including application performance testing with industry-leading middleware providers such as Solace, 29West (now part of Informatica), NYSE Technologies, and Thomson Reuters.

## Business Benefits

The Cisco Algo Speed HFT solution provides unique value to firms looking to optimize performance in the ever-evolving HFT market, including:

- **Maximizing revenue potential:** Offering a combination of speed and no packet loss, Cisco Algo Speed HFT provides performance when it counts – at market opening and closing and when news breaks, which is when HFT firms can make the most of revenue potential.
- **Providing a scalable architecture:** The solution provides predictable performance for trading networks that grow with the business.
- **Optimizing infrastructure for maximum performance:** Through partnering with technology leaders such as 29West (now part of Informatica), Thomson Reuters, Corvil, Solace, Intel, SolarFlare, Chelsio, and NYSE Technologies, Cisco Algo Speed tests and optimizes the solution under real-world conditions, resulting in accelerated time-to-market for the new trading platforms.
- **Delivering a holistic solution:** This solution provides the lowest-latency interconnect and unparalleled latency management from market data delivery to order routing to final execution.
- **Supporting regulatory compliance:** By enabling the best execution for their clients, including more timely market data, faster execution and better latency reporting, Cisco Algo Speed HFT helps firms meet the requirements of regulations such as the National Market System (NMS) and Markets in Financial Instruments Directive (MiFID).

## Why Cisco?

Cisco focuses on enabling business capabilities with integrated solutions, not point products. Our solutions address performance, measurement, cost-effectiveness, scalability, and manageability. Deploying a tested and optimized solution reduces your time-to-market and implementation risks.

Cisco uniquely provides:

- Predictable low latency, with no packet loss during bursts of traffic
- Scalable designs, proven in real-world testing scenarios
- Critical relationships in the low-latency market data delivery value chain
- Solutions backed by world-class technical support:
  - 24-hour global support
  - Best practices (tools and documentation) and services for installation and validation
  - Global training, scalable advanced services, and robust escalations

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## For More Information

For more information, visit: <http://www.cisco.com/go/hft>

For the Cisco Nexus 3000 Data Sheet visit:

[http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps11541/data\\_sheet\\_c78-651097.html](http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps11541/data_sheet_c78-651097.html)

For the complete test reports, visit:

- Solace Message Routers with Cisco Nexus 5000 Series and Cisco Catalyst 4900M Testing  
[http://www.cisco.com/web/strategy/docs/finance/c11-583108\\_solace\\_wp.pdf](http://www.cisco.com/web/strategy/docs/finance/c11-583108_solace_wp.pdf)
- Miercom Cisco Nexus Series Switches Competitive Test  
<http://www.cisco.com/go/hft>
- STAC M2 Benchmark with Cisco Nexus 5000 Series, available on the STAC website  
<http://www.stacresearch.com>
- STAC Testing with 29West and Cisco Nexus 5000 Series  
<http://www.cisco.com/web/strategy/docs/finance/29wMsgPerformOn10gigEthernet.pdf>
- STAC Testing with Thomson Reuters RMDS and Cisco Nexus 5000 Series  
<http://www.stacresearch.com/node/3957>
- STAC Testing with 29West Latency Busters Messaging, Cisco Catalyst 4900M 10 Gigabit Ethernet Switch, and Solarflare NIC  
<http://www.stacresearch.com/node/4967>



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