EQUINIX

M2M 2.0

REWRITING THE RULES FOR FINANCIAL TRADING INFRASTRUCTURE

Table of Contents

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Our community includes 60+ innovative trading platforms like Chi-X, EBS, SIX Swiss Exchange, Deutsche Börse and Bloomberg, 150+ financial e-services providers and 680+ networks. These networks in turn link through to thousands of other firms or markets to form a global ecosystem offering fast scalability and customized service across today's diverse and uncertain global financial system. Learn more at: **www.equinix.com/industries/ financial-exchange/**

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EQUINIX

REWRITING THE RULES FOR FINANCIAL TRADING INFRASTRUCTURE

The technology arms race continues, as does the roller coaster ride of global financial markets. Yet the real revolution lies in distributed trading, a new globalized way to do business, being pioneered by the high frequency trading (HFT) community, but increasingly applied by all market participants. We call it next generation machine-to-machine e-commerce (M2M 2.0).

The first generation of algorithmic traders found advantage in a single trading engine colocated near the main market for low-latency execution. Now M2M 2.0 is all about diversifying strategies and distributing software intelligence across multiple markets and asset classes to leverage a wider range of resources and control costs throughout the whole trading community. This has boundless applicability.

The rise of M2M distributed trading is also rewriting the rulebooks for managing the total cost of ownership (TCO) of trading infrastructure. In particular it is increasing demand for global multi-tenanted, network neutral data center facilities. Indeed M2M 2.0 transforms the data center from a local cost center, housing IT equipment and backup systems, to a reliable profit center enabler, hosting mission-critical marketplaces, where both local and remote computers transact business as one global ecosystem.

Data center proximity and colocation services therefore enhance the agility and efficiency of all market participants, whether high or low frequency traders. Both firms that locate servers within the shared spaces and those that access such services over their preferred networks can both drive new business and optimize their own supply chain.

By understanding the competitive advantages of the new rules of M2M 2.0, all investment firms can trade smarter to drive profit from emerging global opportunities.

The New Rules for Global Distributed Trading

- The ever accelerating pace, scale & diversity of markets
- Agility demands non-stop adaptation
- Clustering creates choices
- Deconstruct to reconstruct
- Longer but faster end-to-end supply chains
- Leveraging network neutral ubiquitous connectivity
- Right time processing of alpha and risk
- Pay as you grow finance
- Competitive component outsourcing
- Community = know-how + resources

The rise of M2M distributed trading is rewriting the rulebooks for managing the total cost of ownership of trading infrastructure.

LEARNING A NEW RULE BOOK

Traditionally trading algorithms operated from a single location as a single process reacting to price feeds and other events. Now, as markets and asset classes fragment into a globalized market fabric, speed and competition have put the squeeze on trading performance. Not everyone can be the fastest, so smart traders everywhere are broadening their strategies and splitting up trading intelligence in order to leverage diverse third-party resources and track liquidity more nimbly, as it shifts from one venue to another.

Distributed trading, or M2M 2.0, requires firms to apply a new set of rules to optimize cost while drawing on an ever-widening range of data sources, cross asset opportunities and supply chain skills. Trading strategies can thus exploit both in-house and outsourced algorithms as a straight through, data-driven process, with each node positioned at the right place and time. Such algorithms may be colocated with markets, data sources, customers or suppliers to optimize the supply chain. HFT traders, faced with tough competition and escalating costs, are leading this move to co-located operations, especially with network neutral data centers. Network neutrality simply brings greater choice and finer competitive prices when compared to telco based hosting centers. However, markets, sell side firms and other e-services vendors offering data, analytics or other real-time, on demand services are not far behind, while even low frequency traders and post trade utilities too are beginning to appreciate the cost and agility benefits of distribution.

The drivers of M2M 2.0, the new rules for managing infrastructure TCO and the key role of network neutral data centers are all analyzed below as a five-stage process:

- Going with the flow
- Reconstructing the value chain
- Architecting for speed and/or agility
- Optimizing space and time
- Integrating the back office into the front office

The technology concepts of cloud computing, component outsourcing and 'Software as a Service' (SaaS) are proving powerful tools to facilitate both M2M 2.0 and trader agility. The landscape of the global financial commemity has been transformed.
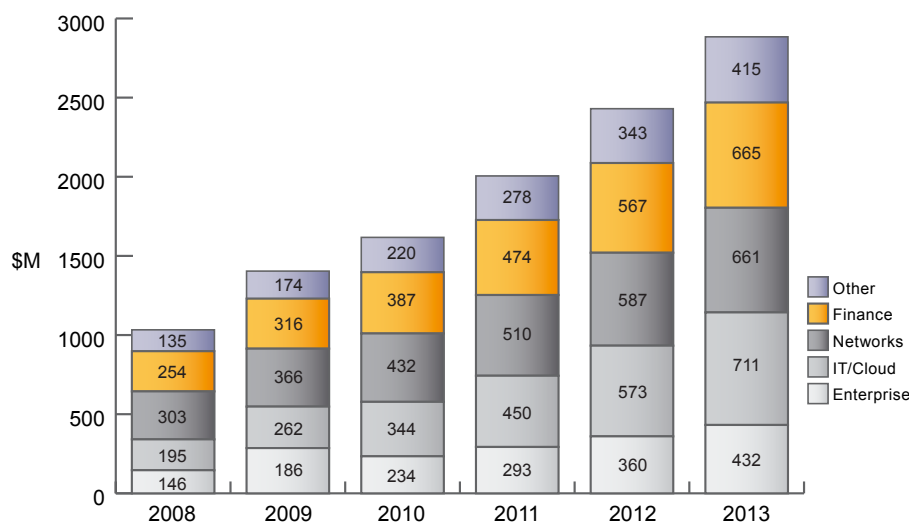

FIGURE 1. GROWING DEMAND FOR EUROPEAN CARRIER NEUTRAL COLLOCATION
SOURCE: IDC

GOING WITH THE FLOW

The pace of change just keeps on accelerating. Despite thin markets, peak message rates continue to climb. In the market sell-off of August, 2011, over 5 million messages per second flashed briefly across US equities, futures and options markets. The peak passed 6 million in September, reaching 6.65 million in October with speculation over the sovereign debt crisis[1]. This was up 137% on the flash crash of May 6, 2010, but without the earlier trauma. Traders only cope with these volumes when colocated with the markets and with agile supply chain partners to support them.

New Rules:

- The ever accelerating pace, scale & diversity of markets
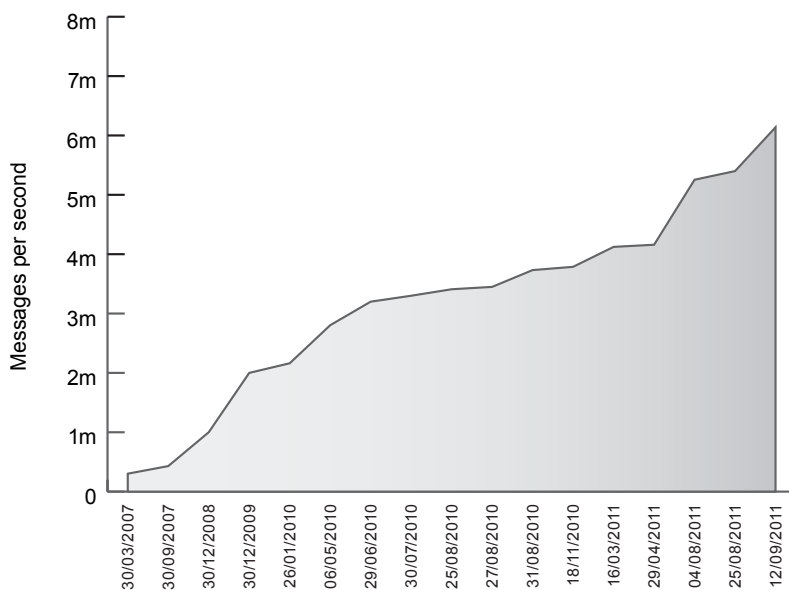- Agility demands non-stop adaptation

FIGURE 2. US EQUITY, FUTURES & OPTIONS MARKETS: GROWTH IN PEAK MESSAGES PER SECOND
SOURCE: EXEGY INC.

Europe too has seen a surge of fast trading, although numbers are still an order of magnitude behind the US. Meanwhile, in Asia ever-faster markets are appearing with the Singapore exchange recently rolling out what it claimed to be the world's fastest trading engine with latencies for order entry response times below 90 microseconds in colocation. Practice however varies hugely between venues. Some technology firms are even forecasting 20 microsecond round trips. Meanwhile, ticker handlers and pre-trade risk checks are driving down into nanoseconds with field programmable gate array (FPGA) and 10 gigabit Ethernet technologies. As latencies converge on zero, the cost to achieve each small advantage increases rapidly with ever shorter half-lives. This has squeezed HFT margins and driven the big money managers into dark pools to minimize slippage against their target price.

As the technology arms race intensifies competition. traders have diversified their strategies, seeking smarter as well as faster solutions to avoid crowded trades. They are exploring new markets and asset classes using increasingly diverse data sources, and deploying distributed, highly parallel, and data driven strategies to cope with the volumes. No wonder multi-tenanted network neutral data centers are so attractive, since they offer the greatest choice of connectivity and e-services providers.

Encouraged by cheap money and the search for yield, portfolio investment flows with emerging markets have taken off. Where US trading once accounted for over 70% of global equities, it is now around 37%. Meanwhile Asia Pacific exchanges have grown strongly, with Europe somewhere in between . As real money shifts, the high frequency traders follow, and exchanges in emerging markets have welcomed them with new technology and services. This has led to increasing correlation and a single global market, operating 24x6.

[1] Based on Exegy data at www.marketdatapeaks.com

However, as one US portfolio manager observed, "We're not just talking here about Chicago traders in Europe or Dutch traders in Asia. We're now seeing Asian traders arbitraging US and European markets or even other emerging markets, such as Latin America or Eastern Europe." A truly global geographical trading landscape is fast becoming a very small and crowded world.
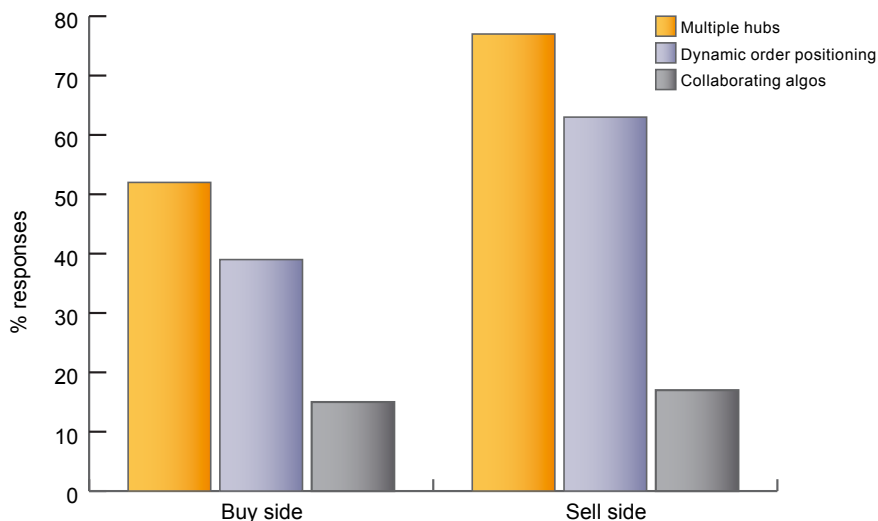

FIGURE 3. AUTOMATED TRADER ALGORITHMIC TRADING SURVEY 2011

This year's Automated Trader survey of over 500 global algorithmic traders confirmed strong growth of distributed trading along with colocation and proximity hosting, particularly among day traders. Over 50% of buy side algorithmic trading firms in the survey had more than one colocation or proximity hub, while 77% of sell side firms had multiple hubs. Of these most firms had some degree of dynamic placement of orders across the various locations even if it was just a fixed rule. However, once placed most orders executed independently of what was happening elsewhere at other hubs. Only around 15% of buy and sell side firms had both distributed and collaborating trading algorithms, which might be deemed the most advanced M2M 2.0 architecture. These architectures are further explored below. The survey confirmed that firms from every region were expanding globally especially in emerging markets. Multitenanted data centers were used mainly to reduce latency, or else to reduce costs and facilitate the use of e-services. The survey also confirmed the strong shift to multi-asset trading with equities, equity derivatives, FX and commodities showing the highest demand, but with promising growth across the board.

Competition, however, is never ending. One European prop trader recalls that five years ago he could run a simple arbitrage between the DAX and Eurostoxx, or Chicago, to make money. "Then everyone jumped in," he says, "So now we have to find more complex, global baskets to trade, driven by multi-factor models." He notes how quickly sentiment feeds through with statarb algos providing "structure for free". While intraday volatility is down, he notes, "when markets do move, we see sharper spikes when all the day-traders rush in to realign things." The only way to avoid toxic trades is to monitor lots of complex correlations constantly. Here too people are starting to use hardware solutions just to keep up with the tape.

As the pace of change accelerates while the scale and diversity of markets grow, agile traders must constantly adapt their models and technical strategies.

Over 50% of buy side and 77% of sell side firms have multiple colocation or proximity hubs.

RECONSTRUCTING THE VALUE CHAIN

Investment firms can no longer tolerate long lead times to plumb services into their data centers. To maximize choice they are clustering in third-party network neutral hubs, where they find both easy access to colocated liquidity and a wealth of ready-to-use, low latency, high volume e-services and technology solutions. Network neutrality ensures fast access to the broadest possible range of services, a virtual community of literally thousands of firms. Traders can thus rely on a real-time supply chain of partners that are only a cross-connect away.

To optimize their supply chains algorithmic traders are also deconstructing existing processes into component services that can be outsourced or relocated for greater efficiency, including:

- Market data services and connectivity
- Research services and reference data
- News feeds and related analytics
- Technical services
- Smart order routing and execution services
- Pre- and at-trade risk checks
- Post-trade performance analysis and reporting
- Clearing, settlement and margin or collateral operations
- Back testing and benchmarking services
- Trade archiving and retrieval services
- Hosting and other technology services
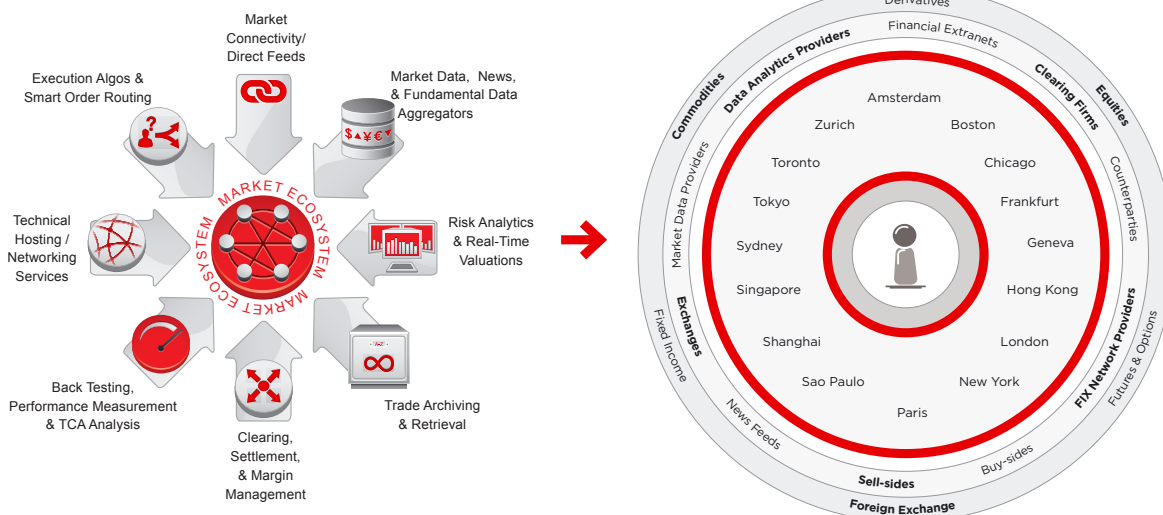
New Rules:

- Clustering creates choices
- Deconstruct to reconstruct

FIGURE 4. M2M 2.0 RECONFIGURES THE DIGITAL SUPPLY CHAIN

Investment firms can no longer tolerate long lead times to plumb services into their data centers.

Under M2M 2.0, as technology evolves, trading algorithms become not only faster, but also more complex, addressing multiple markets and asset classes with smarter strategies. The focus shifts to end-to-end life cycles. This encourages traders to distribute component services across supply chain partners to optimize both time and money.

With over-capacity in slow markets, some Tier 1 banks and exchanges are now attempting to in-source complex trading or technology services to improve their margins. However, as one hedge fund noted, "This unbundling of broker services has hugely increased competition and allowed us to outsource selectively and thereby retain more margin and increase our market knowledge."

E-services offer many hidden benefits, including increased agility when firms move into a new region or asset class. Service providers can often just switch on the connectivity, since they will have already completed their due diligence and development for other clients. That is a huge advantage.

However, there are also heavy competitive pressures to perform and rapid penalties for failure, especially in a network neutral data center where the competition is only ever a cross connect away. Traders can as easily swap out a supplier as engage them, so that raises the bar for everyone.

E-services offer many hidden benefits, including increased agility when firms move into a new region or asset class.

ARCHITECTING FOR SPEED AND AGILITY

So how do firms effectively engineer distributed yet collaborating trading algorithms to span the global market? There are many different architectural strategies to cope with constantly changing markets and technology. With more distribution each trading component can adapt to local needs, accessing local data or services, yet still optimize end-to-end latencies. Once again colocation offerings in neutral data centers provide the right local choices and ubiquitous connectivity for evolving needs.

Some hedge funds, for example, might use a single strategy server per node colocated with Eurex, Liffe and CME, with perhaps a central control server to manage positions and limits and apply an arbitrage strategy between them. The strategy servers may either communicate via the control server, or collaborate directly with each other. FX hedging platforms and less active derivatives exchanges might then be accessed remotely from the most appropriate server location. Alternatively, some firms will insist on trading engines at every node. In Asia multiple servers are the norm, given the large distances. However, if an exchange is slow then it might be safely accessed remotely. Additionally, there might be a post trade risk server, possibly outsourced, to pick up drop copies and margin calls and send out risk signaling in a standardized way.

"When the market became too competitive for simple algorithms," said a multi-strategy trader, "we looked cross market for opportunities. We began with a simple master-slave arrangement with the master node trading the less liquid futures product in one colo, while the slave node managed the hedge in colo with another more liquid product. This kept things simple."

"Volatility levels can change very quickly and liquidity shift from one venue to another – in minutes or even seconds at times," observes a European prop trader. "You just have to adapt taking market microstructure and local rules into account. This is the role of our central control server. It can launch new strategies in different locations or vary the capital allocated to each."

These dynamic elements also adapt to constantly changing latency and liquidity patterns as brokers and telecom carriers leapfrog each other's latency claims. This led one Swiss hedge fund to move from a two to a three-tier architecture to optimize its cross-market and cross-asset strategies. A fast intermediate tier was introduced to maintain the models for regional colo centers. "It's a constant learning process," they observed.

For market data, most high frequency firms will take both direct feeds from each exchange and some slower, but richer, aggregated data or news feeds from third party networks. For the lowest latencies, mesh networks are used that capture, normalize and filter each feed colocated at source and then multicast the normalized feed to all trading nodes over the shortest possible network routes. If aggregation is required that would be done as a pre-process to the trading engine. Accurate latency data can also be measured with this model to allow smart order routers to take best execution decisions. Retransmit requests for market ticks also involve fewer delays if the feed handler is colocated with the data vendor rather than operatng remotely. Customizations are also quite easy and share-able where the main work is done at source. Of course, less latency sensitive firms may optimize on costs, using perhaps a standard extranet, even if it means leaving a few basis points on the table.

New Rules:

- Longer but faster end-to-end supply chains
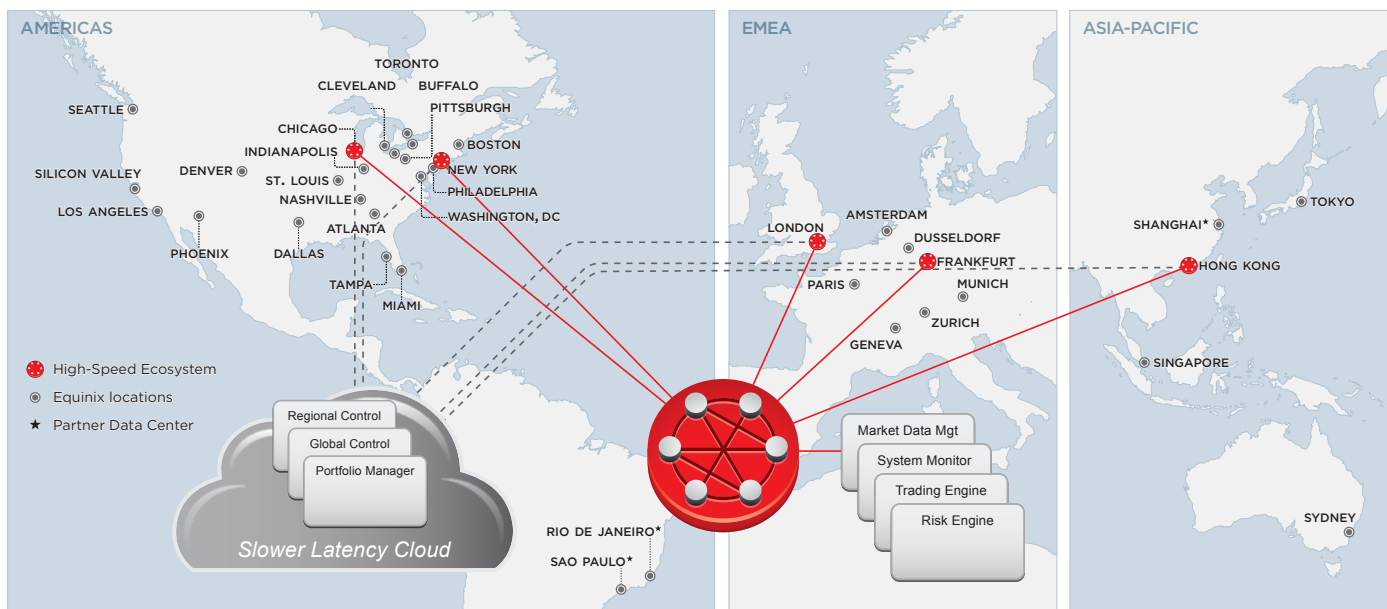- Leveraging network neutral ubiquitous connectivity

FIGURE 5. DISTRIBUTED TRADING ARCHITECTURES

Traditional aggregated feeds required extra network hops which add significant latency to normalize data at a central node and then broadcast it to all subscribers. This is much slower and less flexible for the data vendor compared to the mesh approach where data is broadcast at each source, directly transmitted to every trading engine and then aggregated within the feed handler. Nor can it provide latency metrics since it is not following the direct link paths between markets and traders. So market data aggregators are either moving into the colocation centers themselves or offering their own colocation services to traders, who wish to optimize on end-to-end latencies.

All of these innovations show how M2M 2.0 encourages architects to move processes to the data instead of bringing data to the process. Being more data-driven, rather than process-driven, distributed strategies facilitate both agility and speed.

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OPTIMIZING SPACE AND TIME

Managing space and time are crucial for successful trading strategies. In M2M 2.0 this means optimizing when and where we process market data and trading decisions, but also how we allocate infrastructure capacity. These processes are linked since latency is a function of geography, connectivity and capacity. Nowhere on the planet is potentially much more than a blink-of-the-eye away (0.15 seconds), but many connections are rather slower. Moreover, what really counts is relative time: the difference between my cycle time to market versus yours. In practical terms round-trip times for low and high frequency traders might differ by 50:1 or more on short-haul journeys, but sudden bottlenecks or technical glitches can quickly distort this. Thus latency anomalies are key danger signals. An automatic network failover to a back-up circuit could delay traffic by many milliseconds even after 'recovery'. Yet if the algorithm cannot detect such shifts, fill rates will decline. Alternatively if a trading engine suddenly generates too many orders per second, the burst itself could saturate an exchange gateway and trigger delays. The only way to know the reliablity of market data is to keep a tight control on unexpected latency deviations. High performance algorithmic trading really demands a continuous calibration and tuning process because market infrastructure and trading conditions are constantly evolving even intraday.

Consequently many traders invest hugely to keep accurate time. One global bank aims to manage time to within 20 microseconds. Such confidence can be invaluable for order routing or statarb decisions. Some algorithms try to track everything including latencies, inter-tick time delays, and event spreads between markets. Since traders rely on financial networks or their brokers for market access, the right partner could well depend on a sufficiently accurate time-keeping system.

Pay-as-you-grow finance using cloud and other scalable SaaS technologies is another new Infrastructure rule for M2M 2.0. Inadequate resources immediately impact on performance, yet in a distributed architecture prediction of demand peaks by node is doubly difficult, as liquidity shifts intraday and volume spikes depend on sentiment. This is exacerbated by the shortening of investment life cycles, as we approach zero latency. Thus, there is little incentive to over-engineer a solution, since the infrastructure may itself become obsolete long before it is needed to meet real demand. Yet predictable response times are crucial just when markets are congested and volatile. Wherever practical, traders are turning fixed asset purchase decisions into services streams with pay-as-you-grow finance. This is just another example of being in the right place at the right time.

New Rules:

- Right time processing of alpha and risk
- Pay as you grow finance

The only way to know the reliability of market data is to keep a tight control on unexpected latency deviations.

INTEGRATING THE BACK OFFICE INTO THE FRONT OFFICE

As the world speeds up and space morphs increasingly into time, investment firms need to gear up their back office as well as their front office:

- Back office inefficiencies can mean uncompetitive front office pricing, higher operational costs for clients and lost revenues

- Back office ex post batch processes like margin calls, compliance checks or corporate actions have become ex ante input parameters into real-time trading decisions

- Back office strategies like component business process outsourcing (BPO) are also becoming familiar as real-time distributed trading

- Back office issues like change management and back-testing need to be fully integrated into front office skill sets, as innovation becomes pervasive and strategies need to respond to constantly changing market regimes

New Rules:

- Competitive component outsourcing
- Community = know-how + resources

Back Office:

- Inefficiencies and risks
- Batch Analytics
- Performance
- Optimisation / outsourcing
- Change management

becomes

Front Office:

- Pricing
- Real-time Pre-trade checks
- Broker-dealer selection criteria
- Optimisation / outsourcing
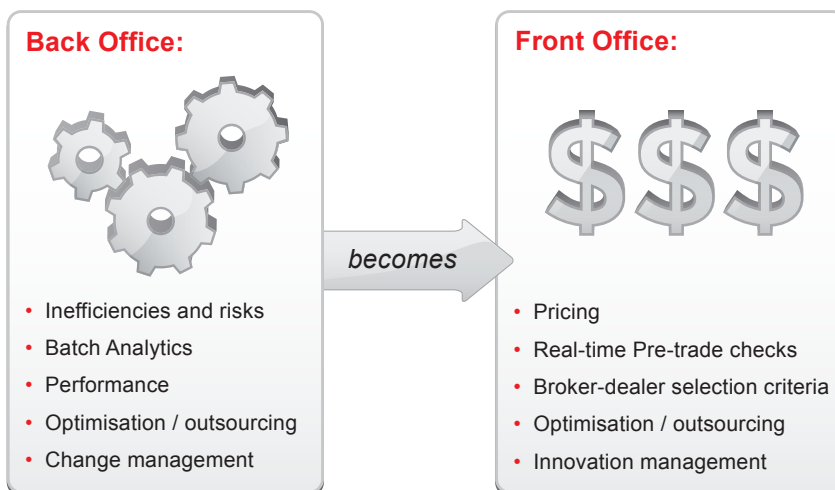- Innovation management

Figure 6. Back office becomes part of the new front office

As one prop trader put it, "The faster we get, the more we focus on safety and risk management. So we have a whole set of algos focused on risk and controlling P&L, imposing position limits and transaction rules and calculating other risk-metrics. Every trading engine sends copies of orders, executed trades or other signals to the control instance. We monitor the global position centrally, but then allocate capacity out in real-time to each trading engine."

Regulators have also come to the same conclusion as illustrated by the SEC's latest market access rules for broker-dealers. Soon if you cannot control it, cross product, cross-market and pre-trade, you will just not trade it. The risks are becoming so great.

Even change management is changing. As another Swiss hedge fund observed, "As markets accelerate and more participants trade faster, conditions change. Back testing with last year's data may no longer be relevant." Few processes will survive unscathed in the demanding world of M2M 2.0.

If traders are to get smarter as well as faster, they need to co-opt partners that can share costs and the risks of pioneering, while contributing real knowledge, experience and pooled assets. All of the partners then interoperate in real-time as a set of collaborating e-services to achieve each trading firm's objectives. Many people describe this emerging reality as SaaS or cloud computing. However, the scalable, colocated e-services of distributed trading give a new meaning to these terms. By leveraging colocated multi-partner resources, traders can manage the scale and diversity of global markets, while their firms gain real agility.

EQUINIX ENABLING M2M 2.0 – THE NEXT GENERATION

M2M 2.0 is still evolving. We continue to learn the new rules for distributed trading in a global market and discover new benefits.. The old paradigm of centralized processes protected by the proprietary fortress data center of each firm has been blown apart by the torrent of market data and the speed and scale of global M2M e-commerce. Supply chain processes are now data driven, distributed and collaborative. There is no going back.

Equinix has grown with the rise of algorithmic trading and M2M 2.0. We have seen first hand and in many cases led the transformation of the data center from back office administrative factories and cost centers to front office profit enablers. As each generation of market participant arrived, Equinix expanded, reconfigured its machine accommodation and tightened its physical security and technical supervision. Now the best places for meeting customers, component service providers and other market stakeholders are the network neutral data centers expanding around the global financial hubs. That is simply where everyone is building and investing. Since everyone shares the same operating environments only a cross-connect away, it is easy to meet, transact and interoperate. Yet competition is intense and firms will need to rethink their go-to-market strategies as well to position themselves in the global markets.

The shift to network-neutral data centers has encouraged both competition and innovation in the financial marketplace. They facilitate easy clustering of markets and ecosystem services, whereby each vendor can retain their preferred network partners while the network effects of sharing a common hub reduce costs and increase choice for the whole community, both local and global. They guarantee best service quality delivery from vendors and allow customers to gain the best prices for services and network access across the entire supply chain, controlling costs and developing opportunities for all.

Distributed trading is changing global markets and rewriting the rulebooks for financial market infrastructure for all partcipants. It has also firmly established the network neutral data center as the platform of choice to take advantage of the growing global opportunities while navigating the turbulent post crisis world.

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About Platform Equinix

Equinix, Inc. (Nasdaq: EQIX) connects businesses with partners and customers around the world through a global platform of high performance data centers, containing dynamic ecosystems and the broadest choice of networks.

Platform Equinix connects more than 4,000 enterprises, cloud, digital content and financial companies including more than 680 network service providers to help them grow their businesses, improve application performance and protect their vital digital assets.

Equinix operates in 38 strategic markets across the Americas, EMEA and Asia-Pacific and continually invests in expanding its platform to power customer growth.

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