



Discussion paper on Co-location / Proximity hosting facility offered by the stock exchanges

Objective

To seek public comments on a possible solution to provide greater equality and fairness in order handling to the participants that do not use co-location services vis-à-vis participants that place orders using automated trading system and are co-located at the stock exchange.

1. Introduction

1.1. Adoption of various technological advancements in the Indian securities market has transformed the way trading takes place and has, in turn, resulted in the process becoming easier, faster, transparent, and safer for the investors.

1.2. However, adoption of technological advancements in securities market has also brought to fore certain new challenges for market participants, investors and regulators. This paper seeks views on issues related to one such recent development wherein stock exchanges allow stock brokers to locate their trading related equipments within stock exchange's premises.

2. Co-location

2.1. Co-location or Co-hosting is a service offered by the stock exchange (or by third-parties appointed by the stock exchange) to its stock brokers and data vendors to locate their trading or data-vending systems within the stock exchange's premises.

2.2. The concept of co-location in today's world is comparable to the old day's stock exchange trading pit / floor where stock brokers used to locate themselves within the exchange premises to trade. Trading pits have been replaced with *server farms* which host the servers of the trading members. The facility of co-location is typically subscribed by market participants that deploy latency sensitive strategies viz. High Frequency Traders, Market Makers, etc.

2.3. A variant of co-location facility, commonly known as Proximity Hosting, is also offered by the stock exchange or by third-party data centers wherein the trading or data-vending systems of the stock brokers / data vendors are located at close proximity to the stock exchange's premises and have a direct connectivity with the stock exchange trading platform.

2.4. Co-location is many times equated with high frequency trading as it has emerged as a solution to the low-latency requirement of High Frequency Traders. The growth and



success of the high frequency trading is largely attributed to their ability to react to trading opportunities that may last only for a very small fraction of a second, and co-location with its low latency has helped high frequency traders to capture such trading opportunities.

2.5. Globally, stock exchanges such as *Tokyo Stock Exchange, London Stock Exchange, NASDAQ OMX, CBOE Stock Exchange, Johannesburg Stock Exchange, Taiwan Stock Exchange, New York Stock Exchange, BM&FBovespa*, etc., offer co-location / proximity hosting to its stock brokers.

2.6. In India, *BSE, MCX-SX* and *NSE* lease racks to their stock brokers to locate trading servers within the exchange premises.

3. Need For Speed?

3.1. The requirement of speedy completion of the process of trading (i.e. from order initiation to delivery of securities / funds) has propelled adoption of technology in securities market. It may not be incorrect to say that the lesser time it takes to complete the process of trading, the higher the probability of a trade going through. Further, 'speed' at times is also employed as a factor to create *point-of-difference* in the broking industry. The success of trading and business models of some of the market participants such as high frequency traders lies in the ability to receive information from and send orders to the stock exchange as fast as possible. It has been observed that investors, apart from the factor of *cost* (brokerage), regard *speed of access to the trading platform* as an important factor in short-listing a stock broker.

3.2. Typically, the time taken to place an order (T_{Total}) can be represented as summation of time taken from dissemination of market data by the stock exchange till receipt of order by the stock exchange from the stock broker.

$$T_{\text{Total}} = T_{\text{data}} + T_{\text{analysis}} + T_{\text{order}},$$

Where, T_{data} = Time taken for the data disseminated by the stock exchange to reach stock broker;

T_{analysis} = Time taken by the stock broker to analyze the data and place order;

T_{order} = Time taken by the order of the stock broker to reach stock exchange.

3.3. In cases where none of the participants use algorithmic trading (as was the case few years back before the advent of algorithmic trading), $T_{\text{analysis}} \gg T_{\text{data}} + T_{\text{order}}$, as T_{analysis} is usually in the range of seconds while $T_{\text{data}} + T_{\text{order}}$ is usually in milliseconds. In such a scenario investors are not highly dependent / affected by the latency between the stock broker and the stock exchange. The prime focus of the trading community till some time back was to reduce T_{analysis} in order to minimize T_{Total} . Usage of computers / trading



algorithms has resulted in significant reduction in $T_{analysis}$. As a result, the scenario changed such that $T_{analysis}$ has become $\ll T_{data} + T_{order}$.

3.4. Algorithms used for the purpose of trading require fast connectivity with the stock exchange in order to correctly price orders and manage execution risk, and thereby, have required minimizing the latency in receiving market data and transmitting order messages. In order to further reduce T_{Total} , the focus of the trading community has now shifted on minimizing $(T_{data} + T_{order})$. Co-location is being offered by the stock exchanges as a means to further reduce such latency $(T_{data} + T_{order})$.

3.5. Until few years back, the stock brokers (and therefore the investors) broadly had the following options to connect to the electronic trading platforms of the stock exchanges: (a) Leased line connection to the stock exchange's PoP (Point-of-Presence), and, (b) VSAT connection. It may be noted that the different connectivity options demonstrate different 'latency' or 'roundtrip latency' on account of multiple factors such as physical distance of the stock broker from the stock exchange, nature of the transmission medium, number of nodes between the source and the destination, amount of traffic, etc. (Roundtrip Latency is the time taken from initiation of the order from the stock broker's server till receipt of order acceptance confirmation from the stock exchange). Distance of the stock broker from the trading engine of the stock exchange is considered to be the most important factor that determines latency between the stock broker and the stock exchange.

3.6. Right from the days of pit-based open outcry system, investors residing at places closer to the trading pit have enjoyed 'low latency' on account of physical proximity to the stock exchange's trading system. It has been observed that a stock broker situated in Mumbai and connected through leased line observes an average roundtrip latency of 8 milliseconds. Similar figure for a stock broker situated in New Delhi is approximately 33 milliseconds on an average. VSAT provides a relatively slower connection as average roundtrip latency associated with it is approximately 680 milliseconds. Thus, even before co-location was introduced, parity with respect to latency did not exist.

3.7. As mentioned above, the facility of co-location / proximity hosting envisages minimizing the latency with a direct and / or private network connection to provide shortest available physical distance (cable length) between the trading platform of the stock exchange and the trading / data vending systems of the stock brokers and data vendors. It is observed that the average roundtrip latency associated with co-location facility is 2 milliseconds at one of the leading nationwide stock exchanges.

4. Statistics on orders generated from the co-located space

4.1. Advances in technology have fundamentally changed the way orders are generated and executed in the market. A sizeable proportion of the total orders received by the stock



exchanges are now being generated by algorithms. Further, such increase in orders from trading algorithms is being contributed by orders generated from the co-located space.

4.2. As may be seen from the following sample data sourced from the stock exchanges for the month of February 2013, it is observed that orders placed from terminals of stock brokers located at co-located space form a sizeable chunk of the total orders received by the stock exchanges.

Orders received from co-location as percentage of the total orders received by the stock exchanges in their various segments in the month of February 2013

Exchange Segment	NSE	BSE	MCX-SX
Cash Market (Equity) segment	73.88%	7.06%	6.55%
Equity Derivatives segment	94.16%	17.96%	15.71%
Currency Derivatives segment	26.05%	N.A.	27.34%

5. Perception of the market participants / regulators on co-location / proximity hosting

5.1. High Frequency Trading and Co-location have received a lot of media and regulatory attention in the recent past, especially post the May 06, 2010 Flash Crash in US Markets. The discussions have primarily revolved around on whether high-frequency trading and Co-location add value to market quality.

5.2. While various studies across the world have indicated that such technological advances improve liquidity, tighten spreads, etc., some of the commonly held negative perceptions with regard to the facility of co-location / proximity hosting are:

- Co-located market participants that deploy high frequency trading algorithms are perceived by a section of the market to crowd-out the orders of participants who are not co-located. They also hold the view that the low-latency advantage when coupled with the capability of the high frequency algorithms to generate large number of orders in a small time period has the potential to deny opportunity to the participants who are not co-located.
- Further, the factor of closeness to the stock exchange's matching engine provides co-located trading members with an advantage of being the first recipient of the market data and being among the first to place orders.
- A section of the market views co-location facility as expensive and beyond the reach of small participants on account of high fees charged by stock exchanges.



(d) In addition to the above, high frequency trading and co-location have been viewed by some to contribute to the increased volatility in the securities market.

5.3. Regulators across the world appear to be broadly considering two options with regard to co-location – (a) prohibit stock exchanges from offering co-location, or (b) regulate the facility to ensure that the same is provided in fair, transparent and equitable basis. Regulators in other jurisdictions such as SEC, CFTC, ESMA, ASIC, etc have engaged in consultations and examination of the various issues associated with the facility of co-location. International Organization of Securities Commissions (IOSCO) in its report ‘Regulatory Issues Raised by the Impact of Technological Changes on Market Integrity and Efficiency’ dated October 2011, has discussed some of the concerns associated with the ‘co-location’. IOSCO has inter-alia recommended in the said report that regulators should require the trading venue operators to provide fair, transparent and non-discriminatory access to their markets and to associated products and services (including co-location services). With regard to India, Forward Markets Commission (FMC) has recently prohibited usage of co-location facility by the members of the commodities derivatives exchanges.

5.4. SEBI has endeavoured that developments / innovations that may have market-wide implications are not left unregulated and proper guidelines are in place to serve the interest of investors. Given the vast expanse of our country, it may not be incorrect to state that, irrespective of whether a stock exchange offers co-location or not, dissimilar latencies will always be experienced by the stock brokers / investor based on their location. As it is understood that not all stock brokers / investors would opt for co-location, it is felt that focus should be to ensure that:

- (a) the facility is made available on a fair basis and on transparent terms.
- (b) orders generated from a non-located space, on reaching the stock exchange, are provided with a fair chance of execution vis-à-vis orders generated from co-located space.

6. Proposals

In view the above, comments are requested on the following proposals for the facility of co-location / proximity hosting:

6.1. Stock exchange shall provide co-location / proximity hosting in a fair, transparent and equitable manner, including ensuring that all stock brokers and data vendors located at co-location / proximity hosting experience similar latency between their systems and the stock exchange’s trading platform.

6.2. Stock exchange shall ensure that the size of the co-located / proximity hosting space is sufficient to accommodate all the stock brokers and data vendors that are desirous of



availing the facility. Stock exchange shall also avoid situation of monopolizing of rack space by certain stock brokers or data vendors.

6.3. With the view to ensure that stock brokers (and thereby the investors) who are not co-located have fair and equitable access to the stock exchange's trading systems, stock exchanges facilitating co-location / proximity hosting shall implement an order handling architecture comprising of two separate queues for co-located and non-co-located orders such that orders are picked up from each queue alternatively. It is expected that such architecture will provide orders generated from a non-co-located space a fair chance of execution and address concerns related to being crowded-out by orders placed from co-location. The proposed architecture is as described below:

6.3.1. Stock exchange shall identify and categorize orders as (a) orders emanating from servers of the stock broker placed at the co-location / proximity hosting facility, and, (b) orders emanating from other terminals / servers of the stock brokers.

6.3.2. Separate order-validation mechanism and a separate queue shall be maintained for each of the aforementioned categories of orders.

6.3.3. A round-robin methodology shall be used to time-stamp and forward validated orders from the two order-queues to the order-book, i.e., if an order is taken from the queue of orders emanating from co-location / proximity hosting facility, then the next order shall be from the other queue. In the event any of the order-queues are empty, orders can be sequentially taken from the other queue till a valid order arrives in the empty queue.

6.3.4. The time-stamp given as per para 6.3.3 above shall be used to determine the time priority during matching of orders.

Request for Public Comments

Public comments are invited on the above proposals. The comments may be emailed latest by May 31, 2013 to maninder@sebi.gov.in or sent by post to:-

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