TIO02 Lecture Summary

Overview

This document summarises the TIO-02 lecture on tackling desk operations and the regulatory environment. The lecture talks about the process of setting up your trading desk and the business side of algorithmic trading. After this lecture, you should be able to set up your trading desk and have some idea about how to manage funds using algorithmic trading.

The following topics are covered -

- Different trading paradigms
- Types of funds
- Setting up an algorithmic trading desk
    - Market access
    - Physical infrastructure
    - Network infrastructure
    - Hardware infrastructure
    - Algo trading platform
    - Risk management
    - People
    - Regulatory and compliance requirements
- Financial planning for setting up an algo trading desk

Different trading paradigms

Here's a definition of various trading paradigms from an infrastructure perspective -

- When you add a few milliseconds in LFT, it won't affect its performance.
- When you add a few microseconds in MFT, it won't affect its performance.
- However, when you add a few microseconds, it will affect HFT's performance.

Types of funds

Based on the legal structure

- Individual - In this structure, liability is not capped.
- Partnership - For partnership, you will have to register but there's not much compliance.
- LLC - Liability is capped in these entities.
- LLP - It can be defined as a mixture of Partnership and LLC. It requires less compliance and has limited liability.

Based on the type of services

- **Investment Advisor (IA)**
    - They can't trade on behalf of clients. However, they can take a percentage of profits.

- **Managed account/ Portfolio Management Service**
    - These types of services can trade on behalf of clients however, they can't pool them. All client accounts need to remain segregated.
    - They can't take leverage.

- **Hedge Funds**
    - They have much less compliance and can take high risks and leverage.
    - They have a high minimum contribution amount and they can't raise money through a public platform.

- **Mutual Funds**
    - They have stringent compliance requirements such as no shorting, using derivatives only for hedging purposes.
    - There's no minimum amount condition to invest in a mutual fund for generating returns.

Note: Names could be different depending on the area. For example - a Hedge Fund may also be called an Alternative Investment Fund (AIF).

Requirements for setting up an algorithmic trading desk

1. Market access
2. Physical infrastructure
3. Network infrastructure
4. Hardware infrastructure
5. Algo trading platform
6. Risk management
7. People
8. Regulatory and compliance requirements

Market access

Own membership

Advantages

- You don't have to pay brokerage.
- Broker side operational risk is removed.
- Better access i.e. you can pass through the Risk Management System of the broker.

- Capital efficiency i.e. you have to pay cash to a broker. However, if you have your membership, you can give bonds, securities, FDs, etc as well.

Challenges

- The cost of membership is high
- You would have to go through all the regulatory compliance.

Types of membership

- Trading membership Prop/ Alpha (India)
    - They can't take any clients and the cost of compliance is lower
- Trading membership
    - They can take clients but the clearing has to be done through a clearing member
- Clearing member
    - They can take clients and also do the clearing
- PCM
    - They can only do clearing and not trade.

Note:
Details for NSE membership can be found here.
Details for CME group membership can be found here.

Broker access

- If you get broker access, you don't have to deal with the network requirement, cost of membership, compliance, etc.
- You can also get direct market access and capital efficiency based on the agreement. However, there's credit risk i.e. the broker might default.

When should you go for your membership?

When your savings in the transaction cost are 2-3 times the cost of membership, you can go for membership. This is because compliance and other requirements can take up a lot of time.

Physical Infrastructure

- Physical infrastructure refers to the servers and their location. Keeping the server on the same LAN as the exchange is called **exchange co-location**.
- Colocation is not allowed for commodity derivatives. MCX doesn't have a colocation facility. However, there's a data centre right next to it.
- For HFT, colocation is not an advantage, it's a necessity.

- The default server rack size is 42 units. However, you'll need other equipment, therefore can't use all units.
- Power supply provided in limited and 6kwh is the default. A typical server takes 0.5kwh of electricity, therefore, you can put in 12 servers. You should also keep a decent cushion.
- You can also pay on a per-unit basis if the third party offers.
- In India, exchanges don't allow internet access in colocation.

Network Infrastructure

Market data

- 2 types of data are available i.e. snapshot data (every n period), tick-by-tick (TBT) data.
- No. of instruments traded on NSE is in the 10,000s
- To put things in perspective, for the CME group, 1-day TBT data is around a few 100GBs. For NSE, it's around 30-35GB.
- Indian exchanges started allowing TBT in 2010 and brokers are allowed to provide free data to their clients.

Order routing

- Exchange offers different trading lines. At NSE, message trades per second can be 40, 100, 200, 400, or 1000
- If the limit is breached, the action depends on the exchange.

For NSE, more details can be found here.

Point to Point lines

- To get access to your co-located facility, P2P is required as internet access is not allowed inside a co-location facility at NSE.
- You can get access at CME through VPN as internet access is allowed.

Test lines

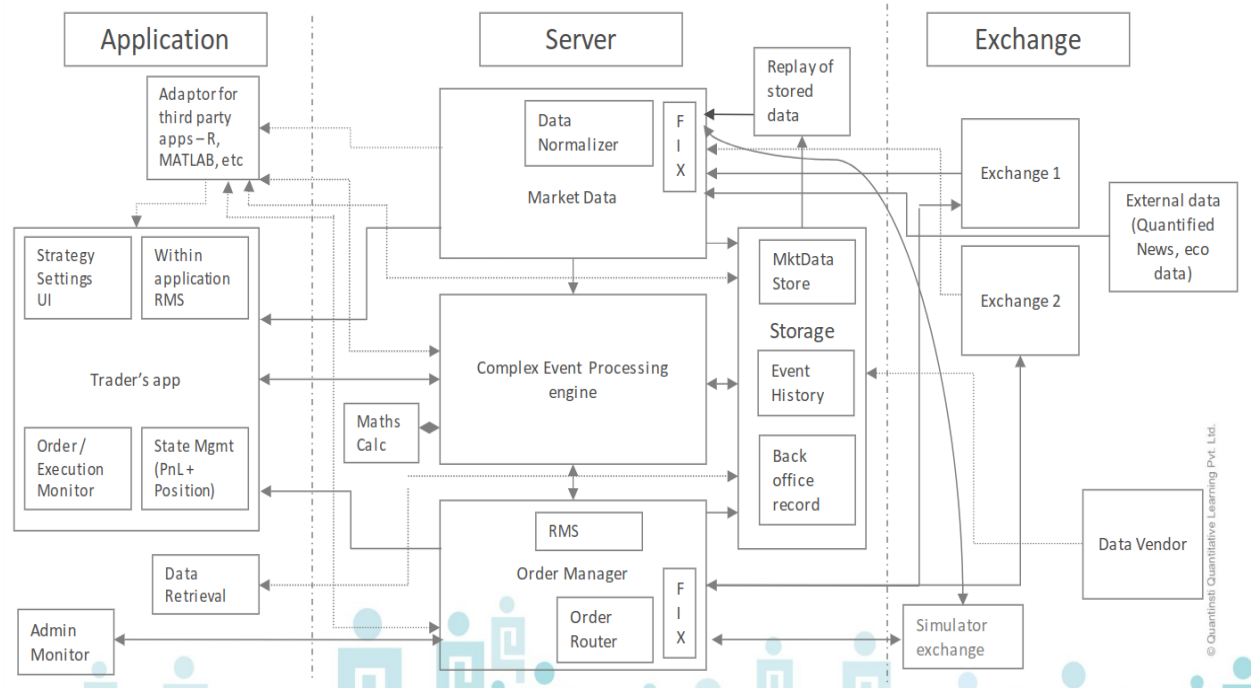
- Aftermarket hours, a few lines are converted to test market lines.
- In the case of NSE, you can take a separate test line.
- Exchanges are used to disseminate information through multiple servers and you take access to all of them. You can check which one is faster and make use of it.
- In global exchanges, they offer incentives for market makers.

Hardware Infrastructure

- Technology changes pretty fast around servers. So, servers need to be changed around every 1-2 years. Other hardware requirements include routers, switches, etc.

Algorithmic Trading Platform

The following snapshots show the infrastructure for an algorithmic trading system



The algorithmic trading platform can be accessed through various methods such as -

- Through broker

  The cost incurred is minimal and the data feed is a few 100ms delayed.
- Through Vendor
  - The data feed is around 100 microseconds delayed. This method can be used for the medium frequency side and it costs a few hundred USD per month.
- HF vendor
  - The data feed is delayed from a few 10 micros to a few 100 micros and it costs a few 1000 USD per month.
- Below 1 microsecond
  - For latency below 1 microsecond, you need to hardcode the strategy into the FPGA chip. It will require you to bypass the OS.
  - Maintaining these is a challenge.

Risk management

- Risk management is crucial for a successful trading endeavour.
- In algo trading, operational risk is really high. It can quite easily become counter-productive. For example - someone's digging and your data vendor's fibre optic cable gets cut.
- We have PRM lectures that talk about risk management in detail.

People

- To set up a trading desk, you need to understand the technology, system, trader, liasioning, market microstructure, research, risk management, the accounting side and all the other things related to it.
- It becomes challenging to do it alone. Therefore, to start off you can begin with 3-5 people. You can then grow your team depending on the requirements.
- Investment in people can turn out to be most rewarding.

Registration and Compliance requirements

- Conformance/Empanelment
    - You need some kind of approval from the exchange to do automated trading. You'll be asked to demonstrate the strategy and qualify certain requirements.
- For CME
    - CERT test environment using VPN/P2P connectivity is used for demonstration.
- For NSE
    - Every strategy needs to be approved for the exchange.
    - Approval is to be taken by the broker and not an individual.
    - Brokers (or you, if you have taken a membership) need to save audit logs, transaction logs, order logs and trade logs.
    - You need to have multiple layers of backups.

Note: These regulations are for the members of an exchange and not for the clients.

Financial planning for setting up an algo trading desk

The following snapshot shows the annual costs (in USD) for setting up an algo trading desk.

Note: These are very crude and tentative numbers in USD

	Developed	Developing	HFT/MFT?	Membership?
Setting up entity	3500	1000		
Office	25000	10000		
Market Access	25000	10000		Y
Colo	12000	8000	HFT	
Mkt Data	50000	1300	HFT	Y
Order routing	20000	27000	HFT	
P2P	2000	1000		
Server & other hardware	40000	50000	HFT	
HF Trading platform	60000	60000	HFT	
MF Trading platform	12000	8000	MFT	
RMS systems	5000	3000		
People	0	0		
Compliance	10000	6000		Y
HFT with Membership	252500	177300		
HFT without membership	167500	160000		
MFT with Membership	82500	39000		
MFT without membership	47500	23000		

Note: ***Please note that this is an estimate to give you an idea about the costs. The actual figures may vary.***