

Testing the crucial system to enable international access to
Indian capital markets



CASE STUDY



About Client
Asia's leading exchange



Industry
Capital markets



Service
Testing

Business **Need**

The client, in collaboration with India's leading exchange, was building a system that would enable its derivative trading (DT) members to trade in India's leading exchange's International Financial Services Centre (IFSC). The client wanted a partner

to conduct the non-functional testing (NFT) to ensure the system met stringent regulatory standards, while being secure, robust, reliable, and scalable with a 99.99% annual uptime.

Business **Challenge**

Globalization has reshaped the world economy. With the vision of globalization, a financial hub was set up in India with tax incentives created by the Indian government with a more relaxed regulatory regime to attract capital to India and export financial services. India's leading exchange has set up its international stock trading unit at the financial hub. This exchange enabled easier access for international investors looking for trading opportunities in Indian securities.

The Client was one of Asia's leading exchanges and in collaboration with the Indian exchange, built a system to enable its members to trade in India's international exchange. These trades executed by the client's DT members will be returned to the client's Derivatives Clearing System for post-trade activities. As a crucial system for orders and trades, it must meet the industry's stringent high availability standards (uptime of 99.99% per year) and be secure, robust, reliable, and scalable. In addition, the system's architecture must be resilient, with no single point of failure.

For IT disaster recovery (ITDR), the system was expected to adhere to the following recovery key performance indicators (KPIs):

1. Recovery Time Objective (RTO): 4 hours
2. Recovery Process Objective (RPO): 0 RPO for trades for India's international exchange. In a disaster recovery (DR) scenario, the India's international exchange will remove all unmatched orders.

Additionally, the system should be capable of downloading trades from the India's international exchange for reconciliation and handling exceptions of market outages at the India's international exchange and system outages at the client's data center.

The client wanted a partner to conduct the NFT for the system to ensure the above conditions are met. While performing NFT, the following challenges must also be addressed:

- ▶ Creation of input test data as per client needs
- ▶ Conversion of input test data into Tick by Tick Data via multicast (MTBT)
- ▶ Testing of multiple releases due to functional and non-functional issues observed during mock and weekday testing
- ▶ Dependency on the weekend mock testing for load testing because of the limited constraint of the India's international exchange's Quality Assurance (QA) environment
- ▶ Customization and use of NSEIT simulator for load testing because of order rate limit constraint of the India's international exchange's QA environment
- ▶ Dependency on the client's team for failover testing since NSEIT does not have access to the process server
- ▶ Creation of the performance test report for weekend mock
- ▶ Publishing test casewise latency and reconciliation report for weekend mock
- ▶ Managing the frequent changes in testing expectations

Business **Solution**

With extensive capital domain expertise and an in-depth understanding of the India's international exchange's functioning, NSEIT became the strategic testing partner for the client. We utilized

our robust and flexible order injection tool called the Volume Generation Tool (VGT), which produces liquidity or load on a simulated market, operating like a live market with similar patterns.

For the client, we used VGT to perform the following functions on live market environment as per the client's data requirements:

1. New order generation
2. Order modification
3. Order cancellation

We conducted the NFT as follows:

- ▶ Set up a production-like test environment, with real market simulation in terms of volume of transactions and complexity of the order book
- ▶ Customized VGT for Financial Information Exchange (FIX) and Non-NEAT Front end (NNF/TCP) protocols and deployed it at the client's infrastructure
- ▶ Injected orders for load testing of the client's system
- ▶ Enabled customizable order rate varying from 0 to 30 transactions per second (TPS) per user for up to 80 concurrent users
- ▶ Enabled horizontal and vertical scalability to inject billions of transactions
- ▶ Using this load, we evaluated the performance of the client's system through KPIs such as latency, throughput, error rate, and server statistics (CPU and memory)

- ▶ Executed fail-over test cases to validate the fallback mechanism of the client's system
- ▶ Conducted detailed planning and estimation throughout the testing process
- ▶ Enabled graphical presentation of order summary and
- ▶ Enabled reconciliation of orders and trades

During NFT, in the drop copy receiver, the clearing members received orders or trades from their trading members and the market data receiver provided access to multicast broadcast messages and identified the missing responses.

Our dedicated expert team of testers and developers ensured appropriate testing within the assignment. We conducted regular team connect and meetings with the client to address issues and plan solutions. Further, we provided dedicated, on-time support during test executions.

Tech Stack



Business Impact

The latency number improved from 4000 milliseconds to 50 milliseconds after phase II of the performance testing

Enabled the client to build stock index-based products from India's international exchange and bring global investors to India



NFT helped the client's system achieve the following KPIs:

- ▶ 250k trades per day
- ▶ 5.5 million orders (new, amended, or cancelled) per day
- ▶ Over 2000 messages per second
- ▶ 80 concurrent FIX users
- ▶ 20 concurrent users with 200 TPS on the DMA server

About NSEIT

NSEIT Limited is a digital native technology company that engineers world-class solutions to help our global customers accelerate their digital transformation journeys. Our key service pillars are Application Modernization, Business Transformation, Data Analytics, Infrastructure &

Cloud Services, and Cybersecurity, through which we create intuitive digital experiences and tangible business impact. For over two decades, our innate drive for excellence has made us the partner of choice for global organizations. At NSEIT, we fuel digital progress.

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