

# SIMBA SPECTRA

## Frequently Asked Questions

This document is provided for information purpose only. Please refer to the service documentation for the detailed description: <http://ftp.moex.com/pub/SIMBA/Spectra/prod/doc/>

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## 1 GENERAL INFORMATION

### 1.1 What is SIMBA SPECTRA?

SIMBA SPECTRA is a low-latency public market data feed for the Derivatives Market, which may be considered as an ultimate market data source for latency sensitive algorithms and HFT. SIMBA is intended to be the fastest real-time derivatives market data interface – faster than all the other currently available services.

### 1.2 Which markets are currently supported?

Currently the Derivatives market (SPECTRA trading platform), the Stock market (ASTS trading platform), and FX market (ASTS trading platform) are supported.

### 1.3 What are SIMBA SPECTRA advantages over other sources of market data available on MOEX?

SIMBA SPECTRA key features:

- the fastest market data feed – it outdoes FAST Full Order Log (FAST FOL) in the vast majority of cases:  $\approx 99,5\%$  (*preliminary internal tests*);
- reduced latency:  $\approx 20 \mu s$  lower than FAST FOL (*preliminary internal tests*);
- “Public Data First principle”: minimized latency arbitrage between public and private market data channels.; Makes price discovery with ‘canary’ orders impractical.
- The SIMBA protocol employs Simple Binary Encoding and allows efficient field access, which is crucial for HFT systems, especially FPGA based ones.

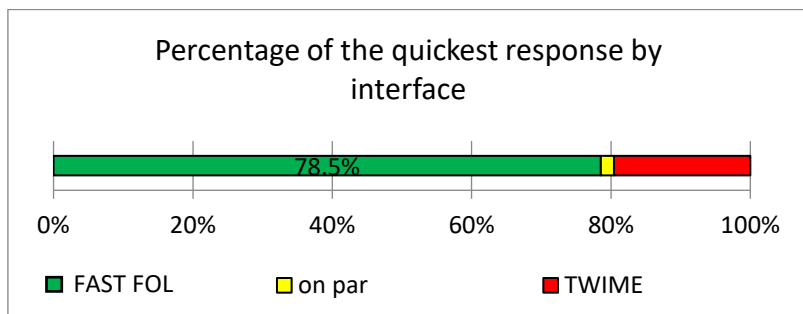
### 1.4 How is the latency advantage over FAST FOL ensured?

SIMBA overall latency is  $\approx 20 \mu s$  lower than FAST FOL:

- $\approx 10 \mu s$  due to [direct connection](#) of SIMBA Gates to the SPECTRA matching engine;
- $\approx 10 \mu s$  due to the new dedicated 10G [network infrastructure](#) in MOEX Co-location.

### 1.5 How does SIMBA minimize Latency arbitrage on the Derivatives market? What does the “Public Data First” principle mean?

One of the key goals of SIMBA is to minimize latency arbitrage between FAST FOL market data feed and TWIME private execution reports, which can be used as market signals in some cases.



Updates in the FAST Full Order Log (FOL) feed are ahead of TWIME in  $\approx 78.5\%$  of cases.

In  $\approx 20\%$  of cases TWIME publishes data faster than FOL.

There are traders who employ orders with minimal quantity to discover price movements through private TWIME execution reports. Other traders are forced to use the same techniques to stay competitive on the market - this increases cost of their systems. Such insufficient orders also lead to excessive load on SPECTRA infrastructure: TWIME Gates, Pre-Trade Risk Check modules, matching core.

SIMBA SPECTRA brings the Derivatives market technological infrastructure closer to the "Public Data First" principle and ensures the priority of public data over private execution reports in terms of their delivery speed. This makes impractical probing the market through the private channels.

### **1.6 Who can benefit from the service? How to use it in a most efficient way?**

SIMBA SPECTRA is intended to serve primarily the needs of ultra-low latency traders and HFTs, particularly the ones who use FPGA-based systems. It is recommended to use SIMBA in a combination with the TWIME trading interface for low latency trading solutions. Furthermore, since both SIMBA and TWIME protocols use similar binary encoding, this can simplify design of clients trading systems.

SIMBA is available only via a dedicated network in MOEX Co-location serving low-latency market data traffic exclusively. Access to the service requires a new separate 10G link. The service is available for clients co-located in both dedicated and shared racks.

### **1.7 What data is available in SIMBA SPECTRA?**

The service disseminates the full order log except off-book (technical) clearing trades and IOC order misses. For users' convenience, SIMBA Gate also provides security definitions.

### **1.8 Where can I find the documentation and related technical information?**

Please find documentation, connection parameters and all the related technical information at <https://www.moex.com/msn/en-simba>.

For more information on networking details please refer to Co-location connectivity guide: <http://ftp.moex.com/pub/ConnectivityGuides/en/MCG1001-EN-Colocation-ConnectivityGuide.pdf>.

### **1.9 Other market data services**

FAST FullOrderLog and standard FAST remain available. However SIMBA is recommended for ultra low latency trading systems as it provides the fastest market data delivery.

Currently there are no exact plans on FAST decommission. Please follow "Moscow Exchange news for developers" newsletter. To subscribe please send a request to [help@moex.com](mailto:help@moex.com).

## **2 FUNCTIONALITY**

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### **2.1 Why is Simple Binary Encoding used? What are its key advantages?**

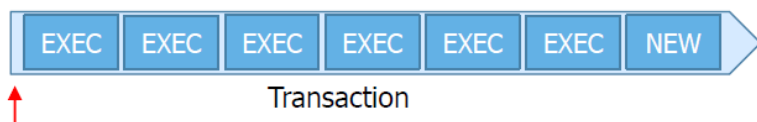
SBE encoded message has a straightforward layout in memory with most of the fields accessible directly by known offset. This is quite important for HFT and ultra-low latency trading systems as it allows prompter reactions to market signals.

Moving towards binary encoding is in line with the best practices of leading exchanges. Furthermore, TWIME trading interface for SPECTRA trading platform also uses binary encoding, so combining these two services may simplify clients' front-end systems development and provide an ability for deeper integration of its' components.

## 2.2 How are new bid&ask prices published?

Every new order that reaches the matching engine produces a “transaction” - a list of order book modifications caused by that new order. A transaction is atomic and published only after all the order book modifications has been done.

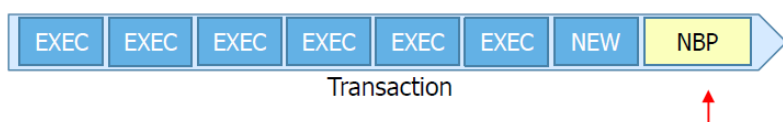
### FAST FOL



The final orderbook state may be obtained only after the whole transactions has been processed.

FAST FOL gate consecutively publishes order book events, which must be processed one by one to find the new final order book state or estimate the price shift.

### SBE FOL



The New Best Prices (bid & ask) published in the beginning of transaction

SIMBA publishes new best bid&ask prices in the very beginning of a transaction. This gives traders equal opportunities to estimate the magnitude of price movement

## 2.3 Are there any plans to change NBP messages, for example add volumes?

Currently there are no such plans, therefore service functionality may be modified based on clients' feedback. Information on planned changes will be published in “Moscow Exchange news for developers” newsletter. To subscribe please send a request to [help@moex.com](mailto:help@moex.com).

## 2.4 In which UDP packet NBP are delivered?

NBP are delivered in one packet together with OrderUpdate/Execution – both on T1 test environment and on production environment.

## 2.5 Which data streams are published by SIMBA?

**Main streams:** SIMBA SPECTRA Gateway broadcasts online order log updates as two identical streams: 'Incremental Feed A' and 'Incremental Feed B'. Each stream is broadcasted via its own multicast group to to mitigate the UDP's unreliable nature.

**Recovery streams:** SIMBA SPECTRA Gateway broadcasts active orders snapshot in a loop as two identical streams: 'Snapshot Feed A' and 'Snapshot Feed B'. Each stream is broadcasted via its own multicast group to mitigate the UDP's unreliable nature.

Please refer to the documentation for more details:

[http://ftp.moex.com/pub/SIMBA/Spectra/prod/doc/spectra\\_simba\\_en.pdf](http://ftp.moex.com/pub/SIMBA/Spectra/prod/doc/spectra_simba_en.pdf)

Configuration files are available at:

- Primary production gateway: <http://ftp.moex.com/pub/SIMBA/Spectra/prod/primary/>
- Secondary production gateway: <http://ftp.moex.com/pub/SIMBA/Spectra/prod/secondary/>

## 2.6 What is TCP Replay service?

The TCP Replay service allows clients to request a replay of messages already published on the Incremental Feed. This service is not a performance-based recovery option and should only be used to recover a relatively small number of missed messages and if any other option is not available.

## 2.7 Instrument status transitions at the start of the Opening Auction

At the start of the Opening Auction, a 'SecurityGroupStatus' message for the session is sent with 'SecurityTradingStatus'=17 ('ReadyToTrade'), allowing trading for all instruments. Apart from that, the SecurityGroupStatus messages are transmitted for instrument groups (with particular 'GroupMask' and 'BaseContractID'):

- with 'SecurityTradingStatus'=2 ('TradingHalt'),
- with 'SecurityTradingStatus'=119 ('Opening Auction').

This behaviour is the result of optimizations made to accelerate dissemination of instrument group statuses. There is a technical peculiarity on the exchange side leading to transient 'ReadyToTrade' status updates – that will be addressed in the future.

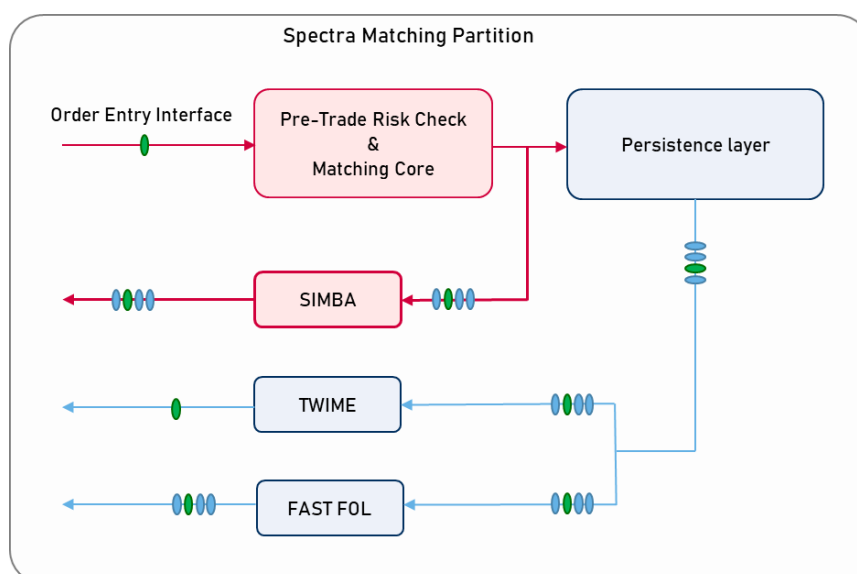
Meanwhile to ensure completeness and consistency of the received instrument group statuses, it is recommended to wait 1–2 seconds upon the start of the Opening Auction. Alternatively, the trading session schedule (from the 'TradingSessionStatus' message) and the opening auction schedule (from the 'DiscreteAuction' message) can be employed. By synchronizing their clock via the PTP protocol (<https://www.moex.com/s2116>), the clients can determine the start of the Opening Auction with precision up to 1 microsecond.

## 3 SERVICE ARCHITECTURE AND IMPLEMENTATION DETAILS

### 3.1 Direct connection to the matching engine

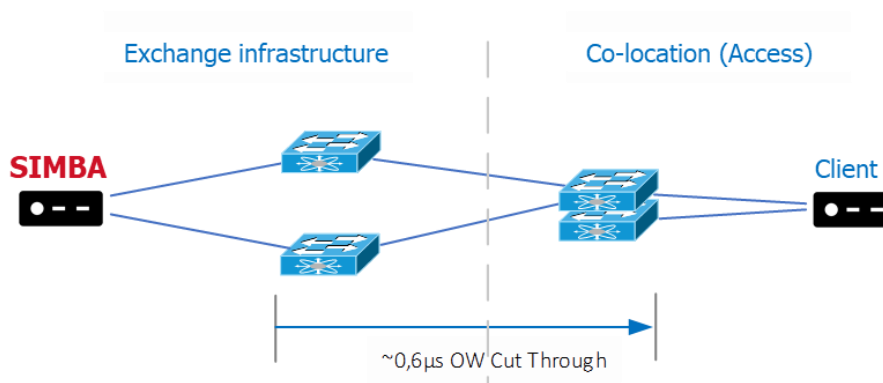
The Primary SIMBA gate is directly connected to the matching engine, while all the other connectivity gates (e.g. Secondary SIMBA, FAST FOL, TWIME) has an additional persistence layer node between them and the matching.

This lets Primary SIMBA gate to process transactions approximately 10 µs earlier than any other gate.



### 3.2 What is the service network architecture?

The following scheme shows the network architecture:



The new 10G network infrastructure is implemented in MOEX Co-location for low latency market data services (currently only SIMBA for Derivatives market, but in future the similar services may be launched for Equities&Bonds and FX markets). This segment serves market data traffic exclusively eliminating interference with trading and auxiliary services' traffic. The network is built on industry-standard equipment supplied by a well-known manufacturer.

One-way latency from client-facing access switch to server-facing access switch is  $\approx 10 \mu s$  lower than for FAST FOL in standard network (*preliminary internal measurements*).

The new dedicated 10G link to low-latency market data network in MOEX Co-location is required to use the service. Both L2 and L3 connections are available.

### 3.3 How the data is transmitted?

Data is transmitted over UDP multicast.

Recovery service is provided over TCP Replay.

### 3.4 Why SIMBA is available in MOEX Co-location only?

The service is primarily designed for HFT and Low-latency trading strategies which are very sensitive to market data delivery times. Such times may only be achieved using 10G links in MOEX Co-location. There is no access to SIMBA SPECTRA over another connection methods.

### 3.5 Why the dedicated 10G link to the new network is needed to use the service?

SIMBA broadcasts data to the new low latency market data network only, which requires separate 10G link. There is no access to SIMBA feed from standard MOEX production network in Co-lo and other connection methods. The dedicated network ensures minimum latency and jitter for market data delivery.

### 3.6 Which connectivity standard is used?

Client equipment is connected with two physical 10G links: 10GBase-SR (fiber multimode). Logical port aggregation and vlan tagging are not used.

Please refer to Co-location Connectivity Guide for more information:

<http://ftp.moex.com/pub/ConnectivityGuides/en/MCG1001-EN-Colocation-ConnectivityGuide.pdf> .

### 3.7 Which routing protocol is used for connecting networking equipment (L3 scheme)?

BGP is used.

ASN on Exchange side is 64533.

ASN on the client's side is allocated by the Exchange from the private range, usually - the same as on other PROD connections, and is indicated when ordering the service.

Please refer to Co-location Connectivity Guide for more information:

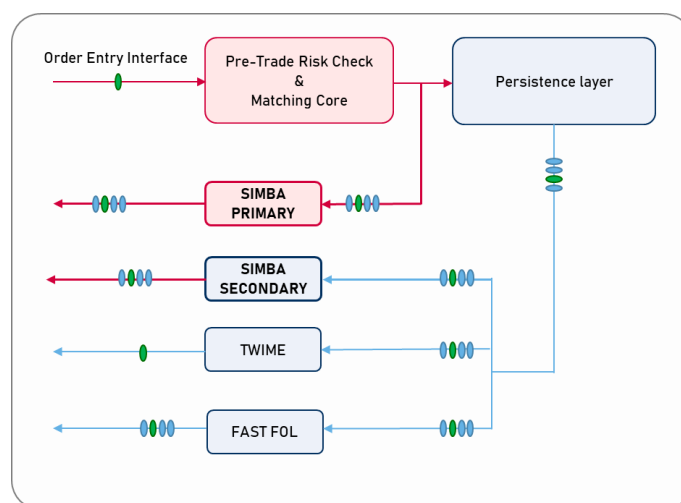
<http://ftp.moex.com/pub/ConnectivityGuides/en/MCG1001-EN-Colocation-ConnectivityGuide.pdf> .

### 3.8 Which backup methods are provided?

There are two SIMBA gateways broadcasting data independently to increase service reliability.

- The Primary gate is connected directly to the matching engine and processes transactions earlier than all the other gate.
- The Secondary server receives data through the Persistence module (alike the TWIME and FAST FOL gates), and thus has higher latency compared with the Primary gate.

It is recommended to listen to the Primary gate multicast groups to receive market data with the lowest latency. If the Primary gate is down, please switch to the Secondary gate and perform the late join procedure.



Networking layer is also implemented with hot backup for both client- and server-side connections. Two links are provided for client's equipment for connectivity resilience. Failure of one of the switches do not lead to complete service unavailability.

### 3.9 Are SIMBA timestamps synchronized with GPS, and FAST timestamps?

MOEX systems are synchronized via PTP since late 2017. MOEX infrastructure receives precision time by GPS signals processed by separate Grandmaster clocks, each with its' own GPS-antenna.

The scheme shows excellent result on public stress tests: time deviation is no more than 500 nanoseconds on high network loads:

"Time synchronization over PTP" service is available in MOEX Co-location. The service allows Client to synchronize own equipment with MOEX Trading Systems Grandmaster clocks.

## 4 SERVICE PARAMETERS

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### 4.1 Which services should I order to use SIMBA SPECTRA?

The service consists of two parts:

- Access to SIMBA software under Information Technology Services Terms of PJSC Moscow Exchange;
- New 10G market data link in Co-location under Telecommunication Services Rules of MOEX Information Security LLC.

### 4.2 May I test the service before purchase?

The service is available on T1 test environment.

Please fill in the following questionnaire to receive instructions on how to connect to the test server:  
<https://www.moex.com/en/forms/poll/questionnaire.aspx?id=03>

Test instance of SIMBA SPECTRA is accessible either from colocation or via test VPN.

### 4.3 Contact details: how to order the service and get tech support

Feel free to contact us in case of any questions regarding SIMBA SPECTRA:

- General questions and to order the service: [ITsales@moex.com](mailto:ITsales@moex.com);
- For technical questions: [help@moex.com](mailto:help@moex.com).

### 4.4 Where can I find service request forms?

Please contact [ITsales@moex.com](mailto:ITsales@moex.com) to obtain service request forms and instructions on how to fill it.  
Also you may download them at:

SIMBA SPECTRA access Service Request form: <https://fs.moex.com/files/19008>.

Service request/change forms for network connectivity in Colocation:  
<http://informationsecurity.moex.com/en/document>.