BISTECH 3.0 Briefing

November 2022
AGENDA

• BISTECH Roadmap
• Motivation of BISTECH 3.0
• BISTECH Statistics
• BISTECH 3.0 Scope and Related Changes
• BISTECH 3.0 IP Mapping Changes
• BISTECH 3.0 Timeline
• Q&A
BISTECH Roadmap

- **2013**
  - Strategic Partnership Agreement with Nasdaq Technologies
  - EDDN service begins for Sarajevo exchange

- **2014**
  - Co-location services for members in BIST datacenter (FIX order entry)
  - EDN service begins for Sarajevo exchange
  - BIST Point of Presence (PoP) opens in London, UK

- **2015**
  - Drop Copy and ITCH services for Co-location members (with Legacy Systems)
  - EDN service begins for Montenegro exchange
  - Equity Market opens on BISTECH platform (Phase 1)

- **2016**
  - EDDN service begins for Macedonian Stock Exchange
  - Drop Copy service for BIST Co-location customers
BISTECH Roadmap

- BIST Sponsored Access/PTRM begins
- OUCH service for BIST Co-location customers

Derivatives Market opens on BISTECH platform (Phase 2)

Dedicated GATEWAY Service started

Debt Securities Market
Precious Metals & Diamond Market opens on BISTECH platform (Phase 2+)

IT Consultancy Support Agreement with Abu Dhabi Stock Exchange

PTRM API Development

IT Development Outsource Agreement with Nasdaq Technologies

April 2023
Motivation of BISTECH 3.0
Motivation of BISTECH 3.0

Increase in the number of trading users/accounts

- 2018: ~700,000
- 2022: ~150,000

Increase in the number of orders/trades

- 2018: 3.731
- 2022: 10.665

Number of instruments (unbalanced load between partition)

- Phase 1
- Phase 2
- Phase 2+

Performance enhancement

- Improving transaction round-trip time (Matching engine & Gateway latency)
- Minimize latency differences between partitions
BISTECH Statistics
BISTECH Statistics – Over the Years

Total Number of Trade by Year (million)

Year: 2016, Total: 110 million
Year: 2017, Total: 167 million
Year: 2018, Total: 253 million
Year: 2019, Total: 297 million
Year: 2020, Total: 739 million
Year: 2021, Total: 781 million
Year: 2022, Total: 922 million
Total Number of Orders & Trades (2021 vs 2022)

2021
Total Trade Number 781M

2022
(11 months)
Total Trade Number 922M
## Breakdown of Numbers by Markets

### 2021

<table>
<thead>
<tr>
<th>Market</th>
<th>Total No. of Orders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Income</td>
<td>3,289,475</td>
</tr>
<tr>
<td>Precious Metal</td>
<td>48,625</td>
</tr>
<tr>
<td>Equity</td>
<td>1,588,175,292</td>
</tr>
<tr>
<td>Derivatives</td>
<td>347,675,919</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Market</th>
<th>Total No. of Trades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Income</td>
<td>905,577</td>
</tr>
<tr>
<td>Precious Metal</td>
<td>19,903</td>
</tr>
<tr>
<td>Equity</td>
<td>665,047,241</td>
</tr>
<tr>
<td>Derivatives</td>
<td>89,035,081</td>
</tr>
</tbody>
</table>

### 2022

<table>
<thead>
<tr>
<th>Market</th>
<th>Total No. of Orders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Income</td>
<td>3,608,318</td>
</tr>
<tr>
<td>Precious Metal</td>
<td>88,217</td>
</tr>
<tr>
<td>Equity</td>
<td>3,243,100,874</td>
</tr>
<tr>
<td>Derivatives</td>
<td>462,553,408</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Market</th>
<th>Total No. of Trades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Income</td>
<td>755,818</td>
</tr>
<tr>
<td>Precious Metal</td>
<td>39,</td>
</tr>
<tr>
<td>Equity</td>
<td>798,505,582</td>
</tr>
<tr>
<td>Derivatives</td>
<td>123,112,528</td>
</tr>
</tbody>
</table>

### Comparison

- **Increasing number of orders**
  - Equity: +104%
  - Derivatives: +33%

- **Increasing number of trades**
  - Equity: +20%
  - Derivatives: +38%
Change in Number of Trades (October 21 vs October 22)

Change in maximum trade number %105
Increasing Trend in Number of Trades by Partition (2022)
BISTECH 3.0 Scope and Related Changes
BISTECH 3.0 New Features

**Change in Number of Partitions**

- Instrument distributions have been rearranged to balance the load between the partitions
- Trading system will process transactions faster and more efficiently (low latency-high throughput)

**Architectural Changes**

- FIX/OUCH Order Entry Gateways will be switched from single-threaded to multi-threaded architecture
- **Partition independent gateways**: As the partition dependency will be eliminated in FIX/OUCH Order Entry channels, related users will be able to send orders to all of the partitions

**Continuous Monitoring and Dynamic Load Balancing**

- Number of partitions will be subject to change for balancing the load (after BISTECH 3.0 transition)
BISTECH 3.0 Partition Composition

Current Version

Partition-1
1511 Instruments

Partition-2
11322 Instruments

BISTECH 3.0

Partition-1
643 Instruments

Partition-2
868 Instruments

Partition-3
1031 Instruments

Partition-4
1125 Instruments

EQUITY & DERIVATIVES (SSFs) + FIXED INCOME (Equity Repo)

Partition-5
246 Instruments

DERIVATIVES

Partition-6
8920 Instruments

FIXED INCOME + PREC. METAL + DERIVATIVES ( Phy. Del. FI)
## Instrument Distribution in Partitions

### Current Version

<table>
<thead>
<tr>
<th>Equity Market</th>
<th>Derivatives Market</th>
<th>Fixed Income Market</th>
<th>Precious Metals and Diamond Markets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Partition 1</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Partition 2</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

### BISTECH 3.0

<table>
<thead>
<tr>
<th>Equity Market</th>
<th>Derivatives Market</th>
<th>Fixed Income Market</th>
<th>Precious Metals and Diamond Markets</th>
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<tr>
<td><strong>Partition 1</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Partition 2</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Partition 3</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Partition 4</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Partition 5</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Partition 6</strong></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Instruments between partitions (current vs. BISTECH 3.0)

Number of instruments (as of 28-11-2022)

Partition-1: 15015; 83%
Partition-2: 3018; 17%

Rate of Partition-1 change in last year: %100 (1511 → 3018)
Rate of Partition-2 change in last year: %33 (11322 → 15015)

Number of instruments BISTECH 3.0 (projected)

Partition-1: 10187; 56%
Partition-2: 1292; 7%
Partition-3: 1726; 10%
Partition-4: 2725; 15%
Partition-5: 287; 2%
Partition-6: 1816; 10%
<table>
<thead>
<tr>
<th>FIX &amp; OUCH Order Entry</th>
<th>FIX Drop Copy</th>
<th>ITCH API</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Each FIX/OUCH user of a market will be able to send orders to all of the partitions</td>
<td>• Partition based Drop Copy connections will continue</td>
<td>• Partition based ITCH data flow will continue</td>
</tr>
<tr>
<td>• Market based separate users will continue</td>
<td>• All existing Drop Copy users will be suspended</td>
<td>• Additional ports for newly added partitions will be defined</td>
</tr>
<tr>
<td></td>
<td>• Partition based new Drop Copy users will be defined with new naming convention</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• FIX API Drop Copy channel failover architecture changed from Active-Passive to Active-Active</td>
<td></td>
</tr>
</tbody>
</table>
Currently, at least two users are needed for different partitions

With BISTECH 3.0, one user can access to all partitions
Second user given for accessing 2nd partition will become obsolete and will be deactivated.

Example:

Member YYY has the following 13 users for FIX Order Entry:

- Equity;  
  YYY_FIX1, YYY_FIX2, YYY_FIX3, YYY_FIX4, YYY_FIX5, YYY_FIX6
- Derivatives;  
  YYY_FIX1_D, YYY_FIX2_D, YYY_FIX3_D, YYY_FIX4_D
- Fixed Income;  
  YYY_FIX1_F, YYY_FIX2_F
- Prec. Metals and Diamond Markets;  
  YYY_FIX1_K

With BISTECH 3.0, for all market connections, it will be able to continue with 7 users, 6 users have become passive:

- Equity;  
  YYY_FIX1, YYY_FIX2, YYY_FIX3, YYY_FIX4, YYY_FIX5, YYY_FIX6
- Derivatives;  
  YYY_FIX1_D, YYY_FIX2_D, YYY_FIX3_D, YYY_FIX4_D
- Fixed Income;  
  YYY_FIX1_F, YYY_FIX2_F
- Prec. Metals and Diamond Markets;  
  YYY_FIX1_K
Second user given for accessing 2nd partition will become obsolete and will be deactivated.

Example:

Member YYY has the following 10 users for OUCH Order Entry;

- **Equity:** YYYEH1, YYYEH2, YYYEH3, YYYEH4, YYYEH5, YYYEH6
- **Derivatives:** YYYDH1, YYYDH2, YYYDH3, YYYDH4

With BISTECH 3.0, for all market connections, it will be able to continue with 5 users, 5 users have become passive;

- **Equity:** YYYEH1, YYYEH2, YYYEH3, YYYEH4, YYYEH5, YYYEH6
- **Derivatives:** YYYDH1, YYYDH2, YYYDH3, YYYDH4
User Set-up with BISTECH 3.0 FIX Drop Copy

- All existing Drop Copy users will be de-activated.
- New Drop Copy users created with new naming convention

Example:

Member **YYY** has the following 6 users for Drop Copy;

- **Equity:**
  - YYY_FIXUEADC1
  - YYY_FIXUEADC2
  - YYY_FIXUEADC3
  - YYY_FIXUEADC4
  - YYY_FIXUEADC5
  - YYY_FIXUEADC6

With BISTECH 3.0 all users will be de-activated;

- **Equity:**
  - YYY_FIXUEADC1
  - YYY_FIXUEADC2
  - YYY_FIXUEADC3
  - YYY_FIXUEADC4
  - YYY_FIXUEADC5
  - YYY_FIXUEADC6

New Users will be created:

- YYY_FIXUEA_DC1_P1_E
- YYY_FIXUEA_DC1_P2_E
- YYY_FIXUEA_DC1_P3_E
- YYY_FIXUEA_DC1_P4_E
- YYY_FIXUEA_DC2_P1_E
- YYY_FIXUEA_DC2_P2_E
- YYY_FIXUEA_DC2_P3_E
- YYY_FIXUEA_DC2_P4_E
- YYY_FIXUEA_DC3_P1_E
- YYY_FIXUEA_DC3_P2_E
- YYY_FIXUEA_DC3_P3_E
- YYY_FIXUEA_DC3_P4_E
Other Channels

Following channels will not be affected with BISTECH 3.0

• Trading Workstation (TW) of Equity Market & Derivatives Market (VIOP) & Debt Securities Market
• Web Trader (KIT) of Precious Metals And Diamond Markets
• FIX Reference Data
• Data Dissemination (Market and Index Data Flow over TIP API) for all BIST Markets
• Pre-Trade Risk Management (PTRM) GUI and API

IP addresses of TW, TIP, FIX, OUCH and ITCH channels will be changed due to new hardware park.

Note: There is no need to renew FIX/OUCH API certificates. Although those who will apply a new certification will be liable to the updated documents of related protocols.
BISTECH 3.0
IP Mapping Changes
The main reasons why we change the Public IP Addresses:

• Due to the rapid increase in the number of gateways, new IP address blocks are needed.

• There are a limited number of Public IP Address blocks worldwide. There are not enough Public IP Address to migration phase of BISTEHE 3.0

Transition Phase:

• The Public IP subnets of Co-location Gateway Servers is going to be replaced with Private IP blocks.

• Only Private IP subnets is going to be used for BISTECH 3.0 Co-location infrastructure.

• The relevant IP addresses which is related each member will be notified member by member during the BISTECH 3.0 transition period.
Current IP Structure of Co-location Gateways

Co-location cabinet
- Customer equipment

BIST Data Center
- BIST Main Switch
- BIST Backup Switch
- Current Gateway Servers for FIX, OUCH, ITCH
- Public IP Addresses
NEW IP Structure of BISTECH 3.0 Co-location Gateways

Co-location cabinet

- Customer equipment

BIST Data Center

- BIST Main Switch
- Main Core Switch
- BIST Backup Switch
- Backup Core Switch
- NEW BISTECH 3.0 Gateway Servers for FIX, OUCH, ITCH
- Private IP Addresses
Transition to NEW BISTECH 3.0 Co-location Gateways

Co-location cabinet

- Customer equipment

BISTECH Infrastructure

- Current Gateway Servers for FIX, OUCH, ITCH
  - Public IP Addresses
- BIST Main Switch
- Main Core Switch
- BIST Backup Switch
- Backup Core Switch
- NEW BISTECH 3.0 Gateway Servers for FIX, OUCH, ITCH
  - Private IP Addresses
Current IP Structure of BISTECH Wide Area Network

- Turk Telekom
- Turkcell
- BISTECH Wide Area Network
- BISTECH Infrastructure
  - Current Gateway Servers
    - for OMNET, FIX, Drop Copy, Reference Data
    - Public IP Addresses
Transition to NEW BISTECH 3.0 Wide Area Network Gateways

**BISTECH Infrastructure**

- Current Gateway Servers
  - for OMNET, FIX, Drop Copy, Reference Data
  - Public IP Addresses

- NEW BISTECH 3.0 Gateway Servers
  - for OMNET, FIX, Drop Copy, Reference Data
  - New Public IP Addresses

Customer Site
- Turk Telekom
- Turkcell

BISTECH Wide Area Network
BISTECH 3.0
Timeline
Milestones

- Launch of BISTECH 3.0 Production Environment for testing purposes: Second half of January 2023 (only weekends)
- Rehearsal tests will be run on the brand new BISTECH 3.0 Production hardware park
<table>
<thead>
<tr>
<th>Pre-Prod Test Environment:</th>
<th>Prod-Like Test Environment:</th>
<th>(NEW) BISTECH 3.0 Test Environment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>It involves application and configuration changes that will take place in production environment.</td>
<td>Generally version of the test system is same as production system. However, new software changes and bug fixes (for production) will be uploaded to this test environment for a certain period of time before production release.</td>
<td>BISTECH 3.0 test environment. For connection details; ‘Bistech 3.0 Test Environment Technical Information Document’: <a href="https://www.borsaistanbul.com/files/bistech-3-0-test-environment-technical-information-document.pdf">https://www.borsaistanbul.com/files/bistech-3-0-test-environment-technical-information-document.pdf</a></td>
</tr>
</tbody>
</table>
Thank You

Any questions?

Contact us : bistechsupport_autoticket@borsaistanbul.com