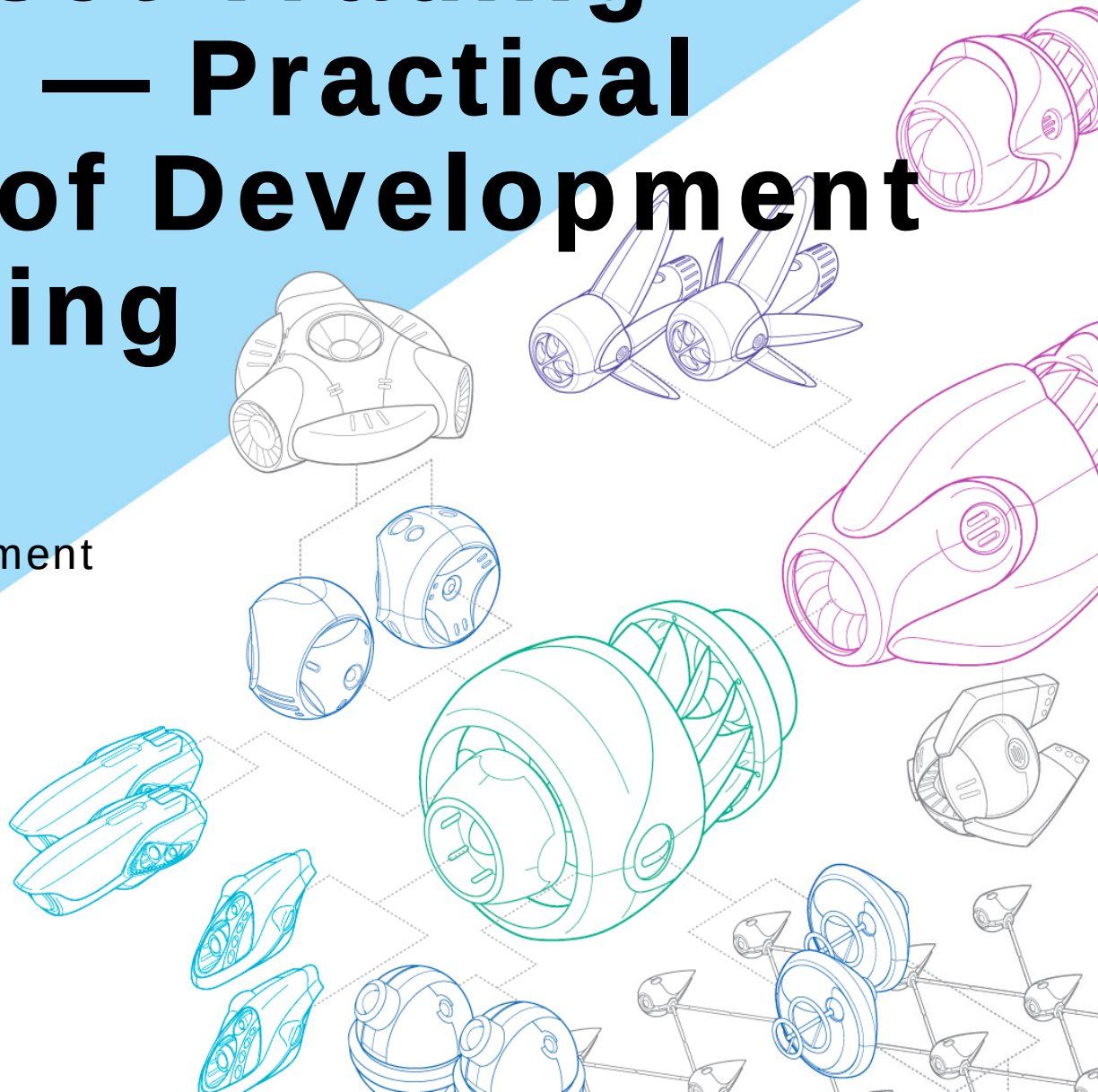
Multi-Asset Trading Platform — Practical Aspects of Development and Testing

Danil Baburin
Head of QUIK development

ARQA TECHNOLOGIES

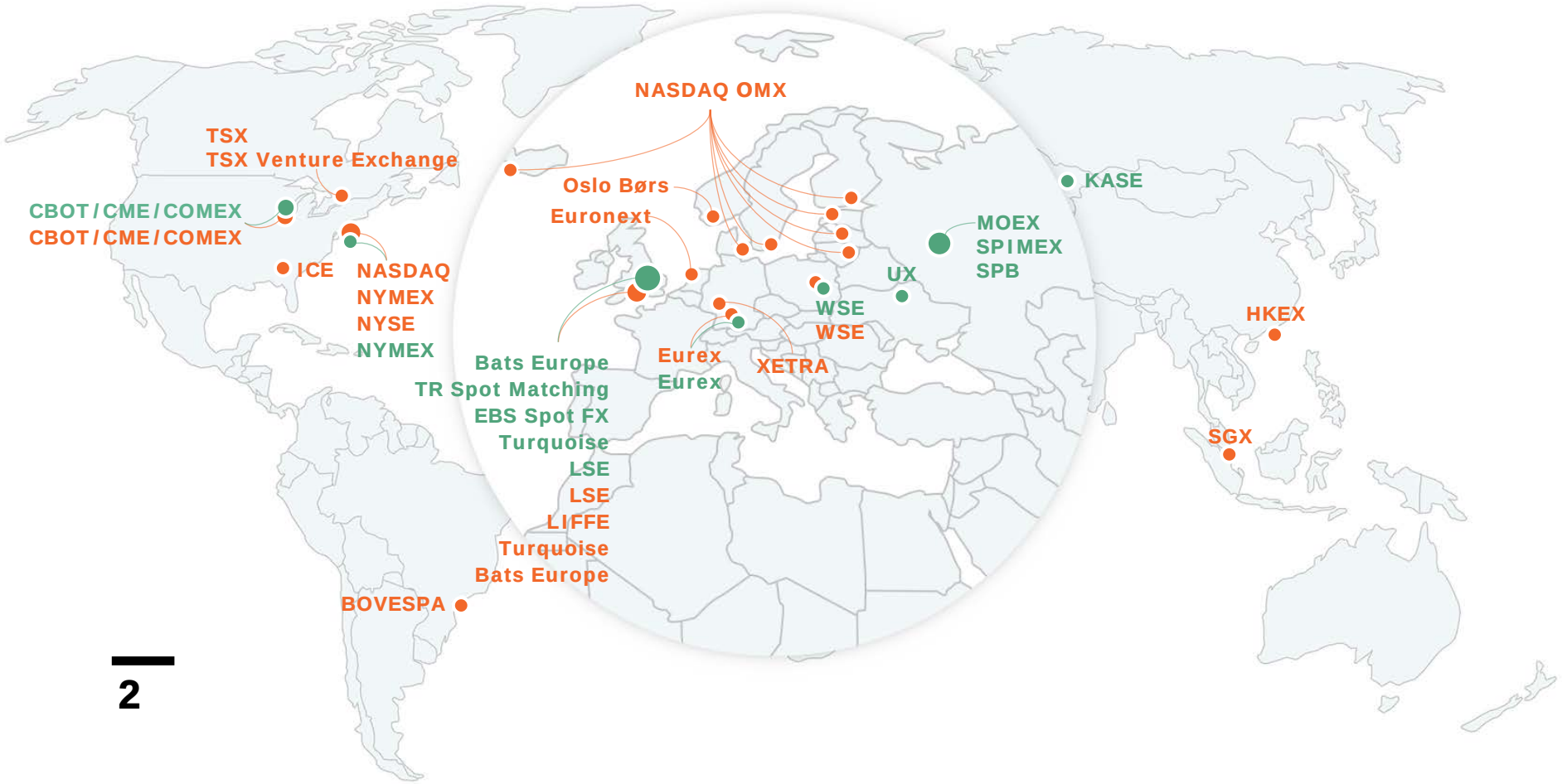


ARQA Technologies key facts

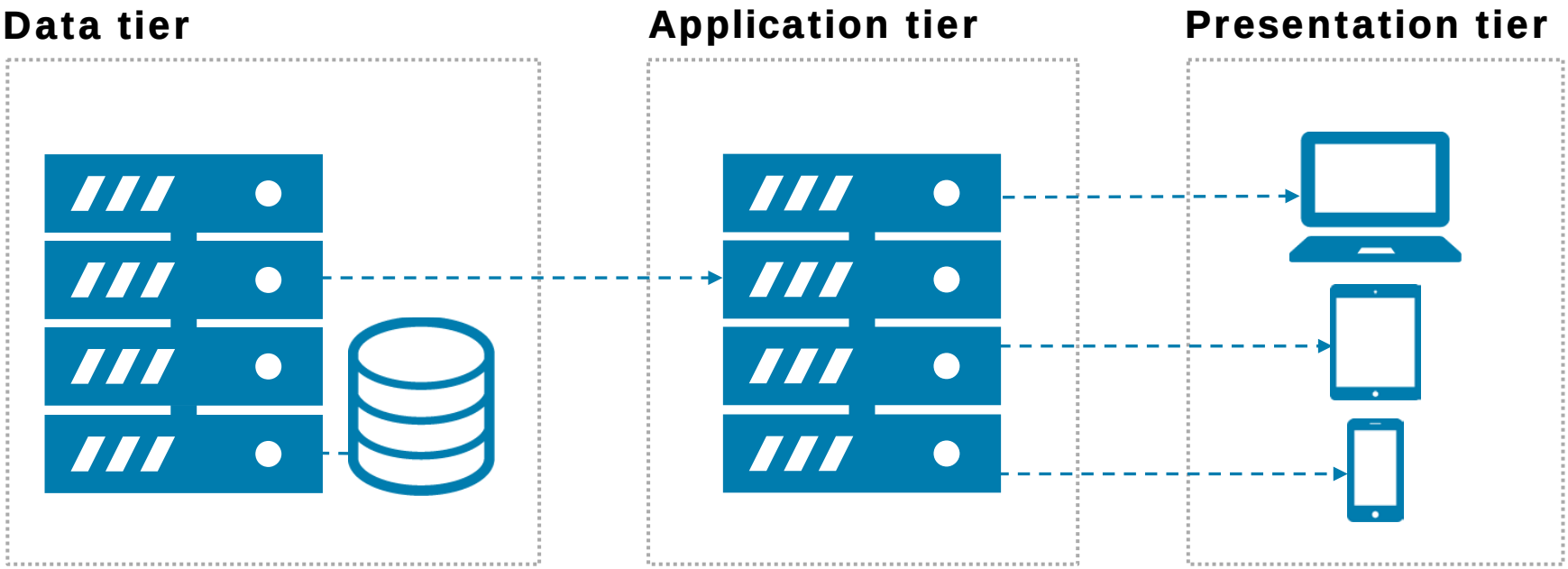
1. Leading independent financial software provider in Russia and CIS
2. 17 years on the market
3. 250+ client base
4. Over 100 000 end screens using it on daily basis
5. Multi-asset, broker-neutral and market neutral OEMS
6. Risk management solutions
7. Trading access to 30+ major venues worldwide

Global connectivity

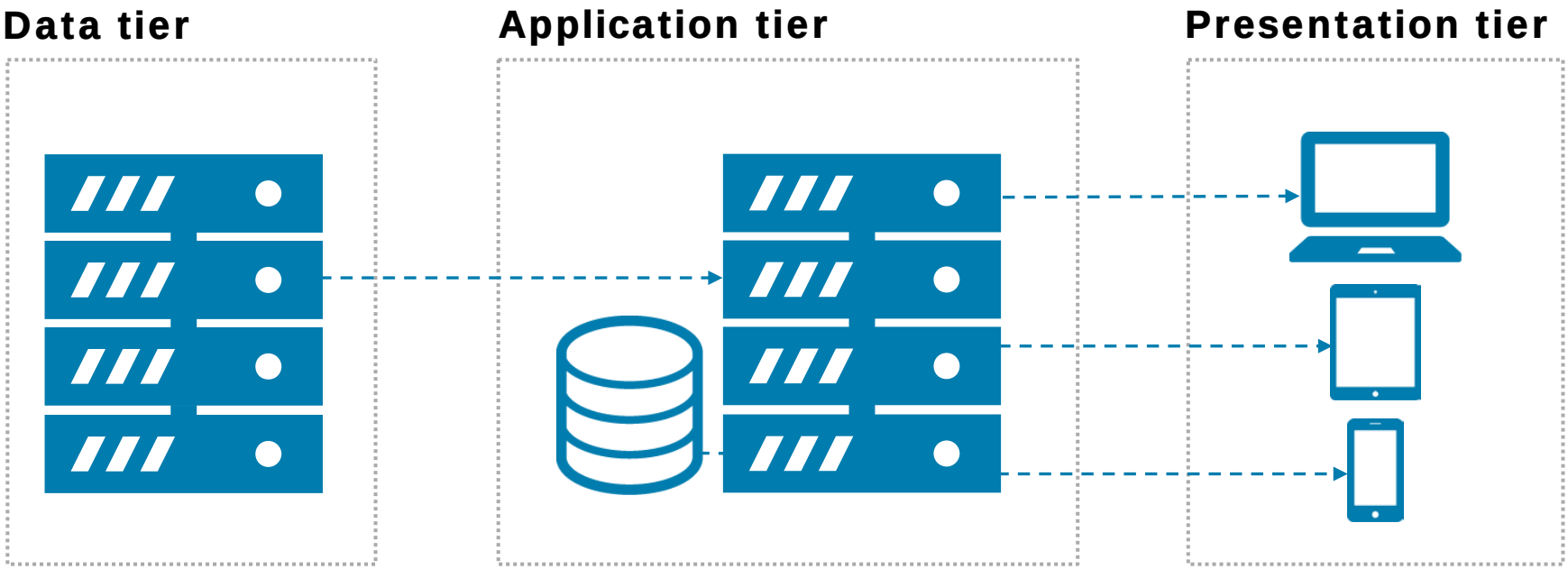
- ‘Direct’ gateways
- Gateways via technological partners



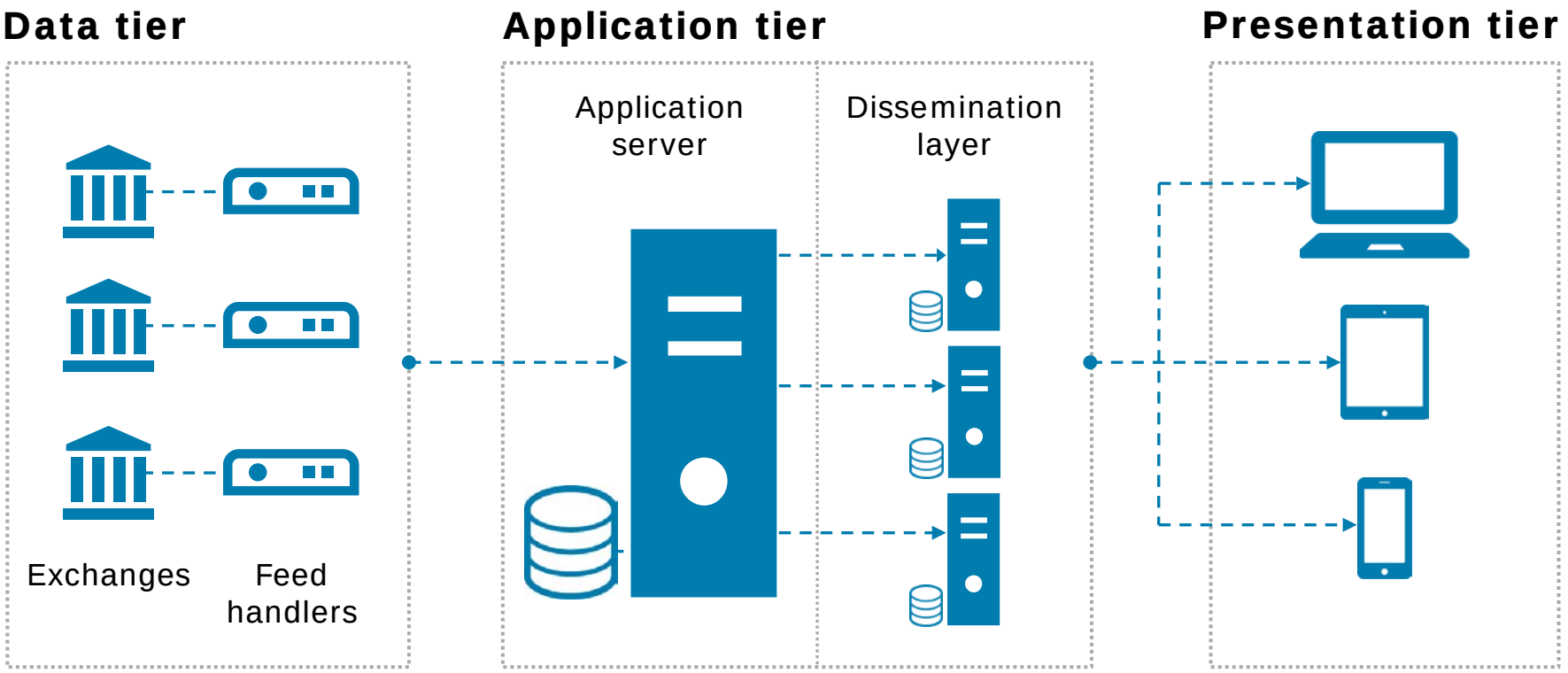
Typical 3-tier architecture

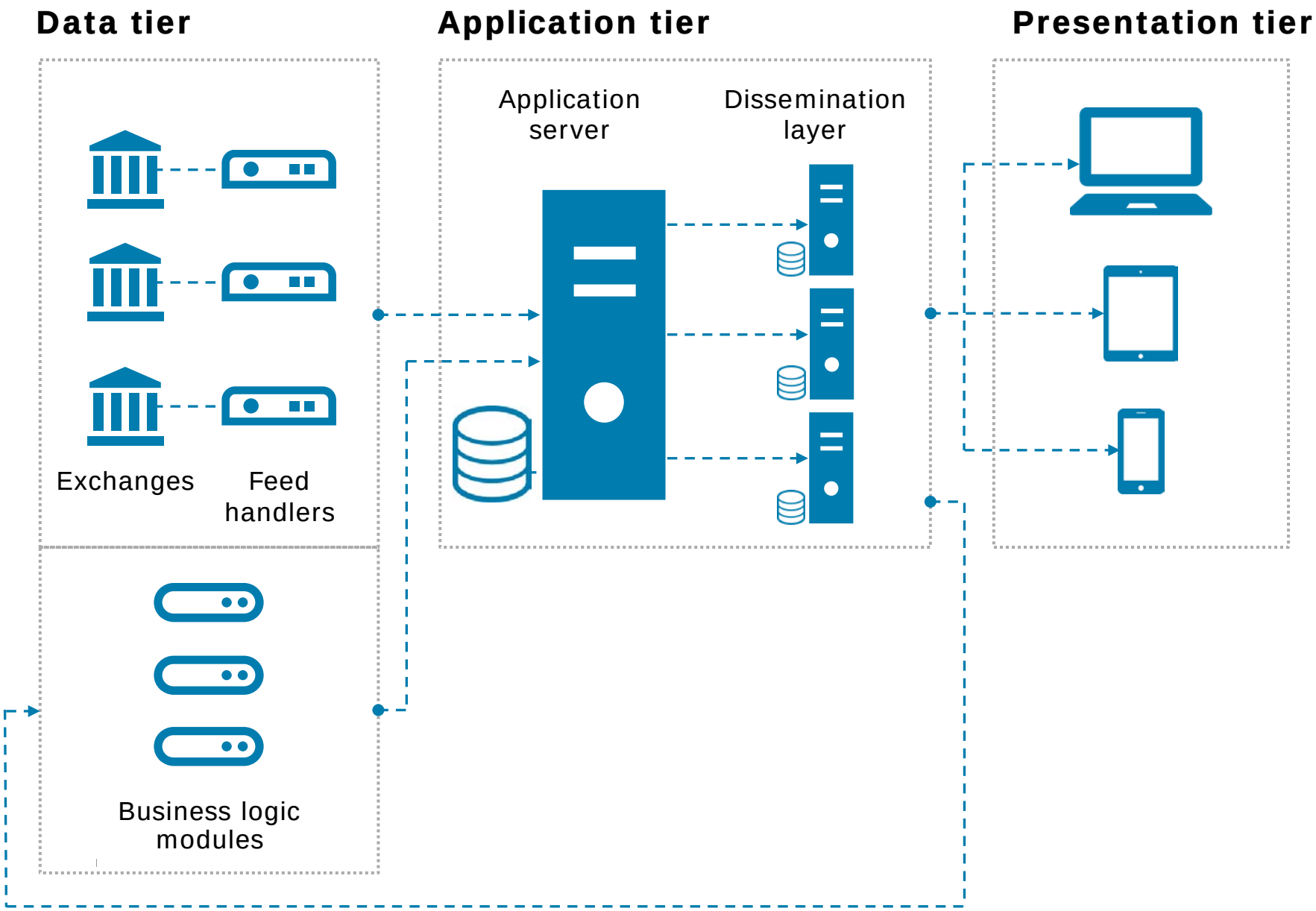


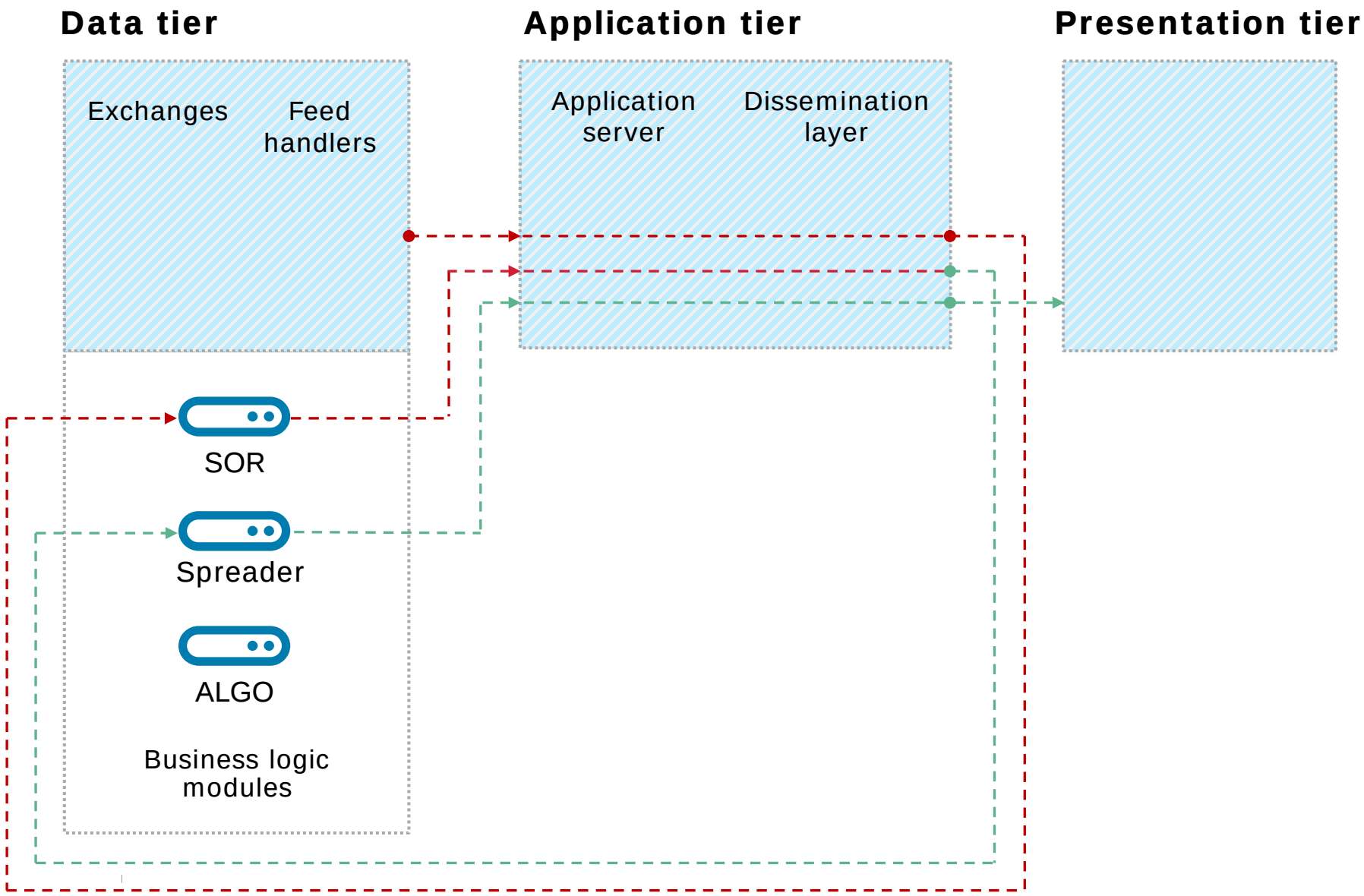
Data stored in Application tier

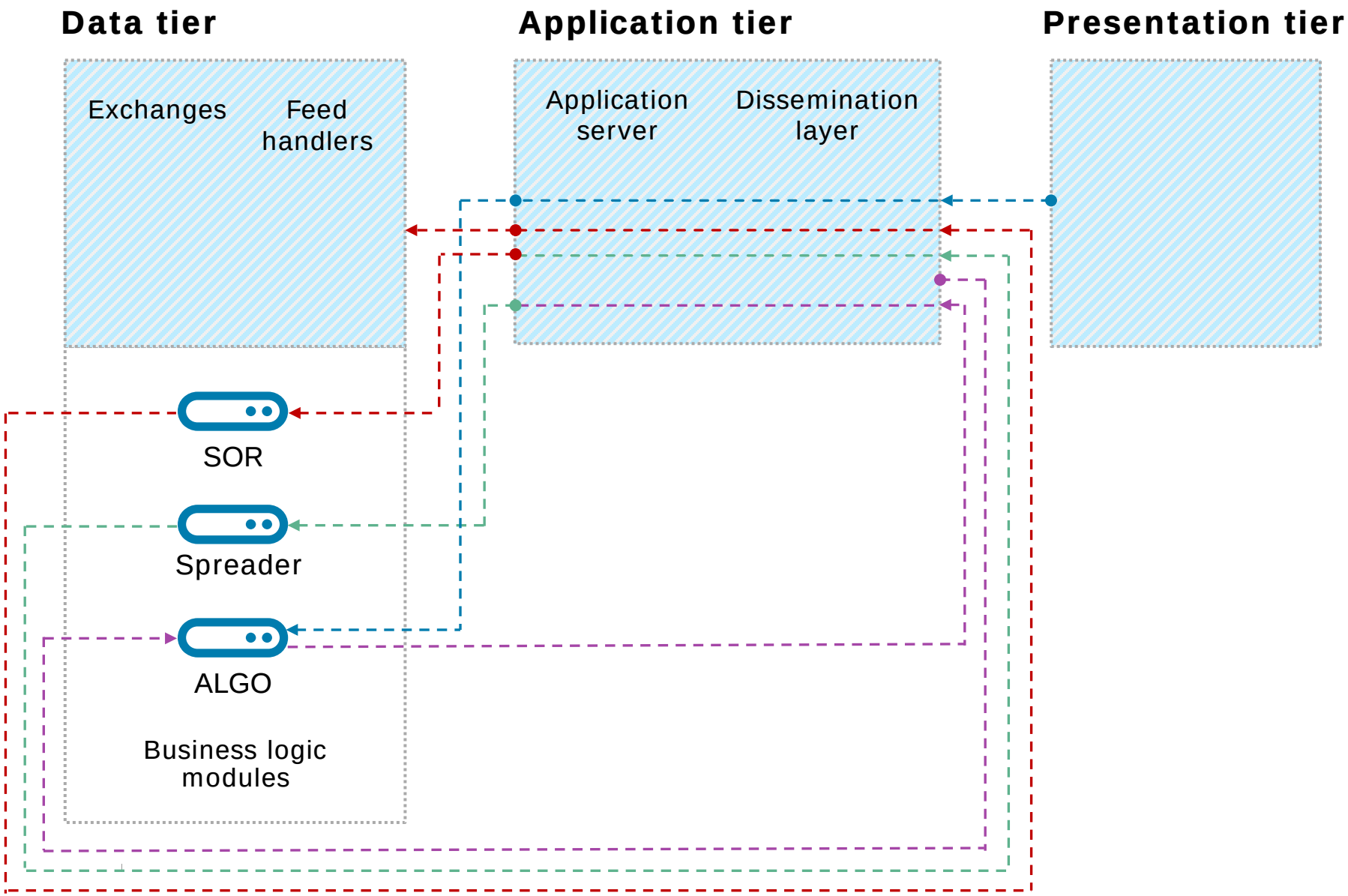


Tier structure




Data tier
Application tier
Presentation tier
Application server
Dissemination layer
Exchanges
Feed handlers
Business logic modules


Data tier
Application tier
Presentation tier
Exchanges
Feed handlers
Application server
Dissemination layer
SOR
Spreader
ALGO
Business logic modules


Data tier
Application tier
Presentation tier
Exchanges
Feed handlers
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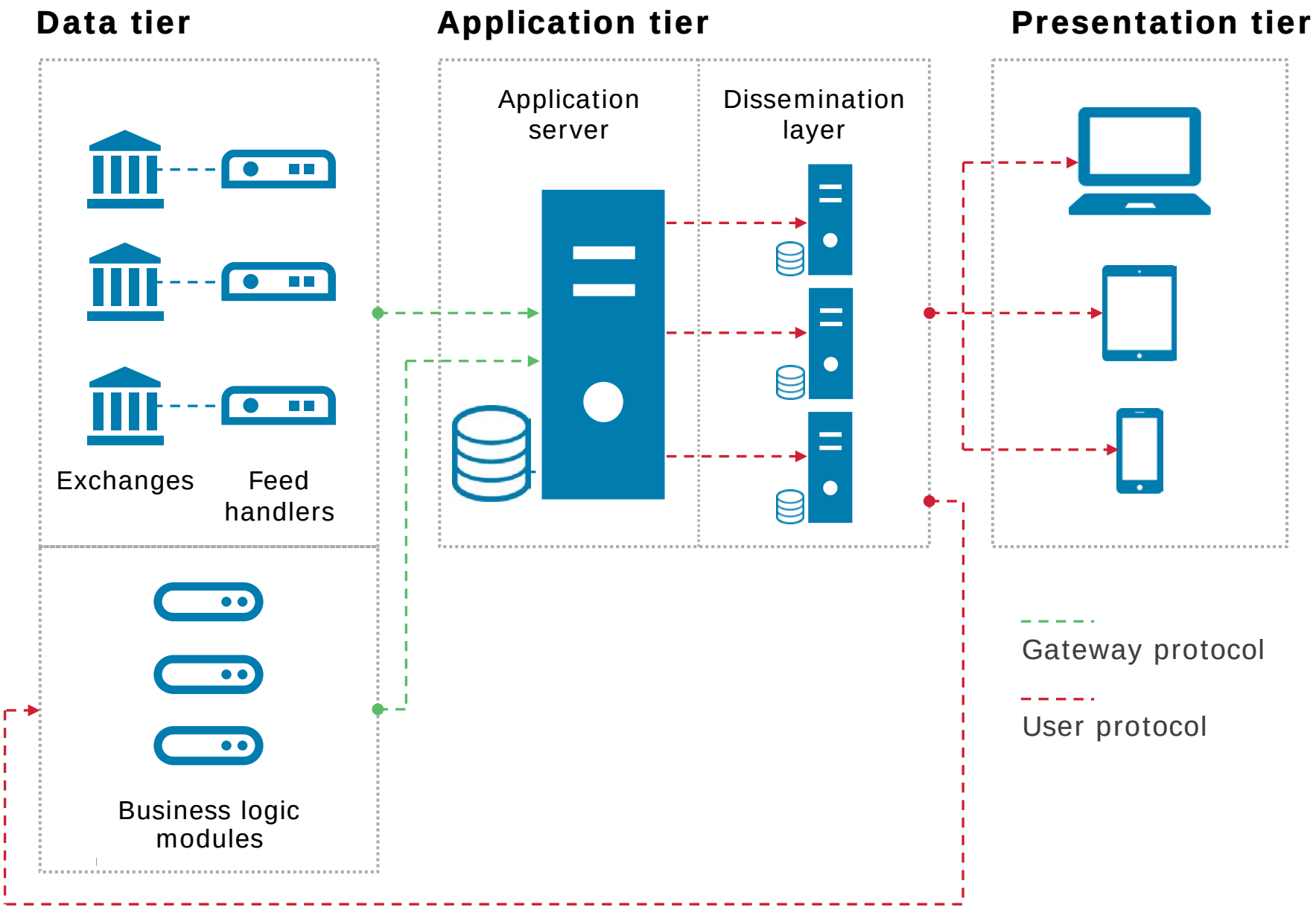
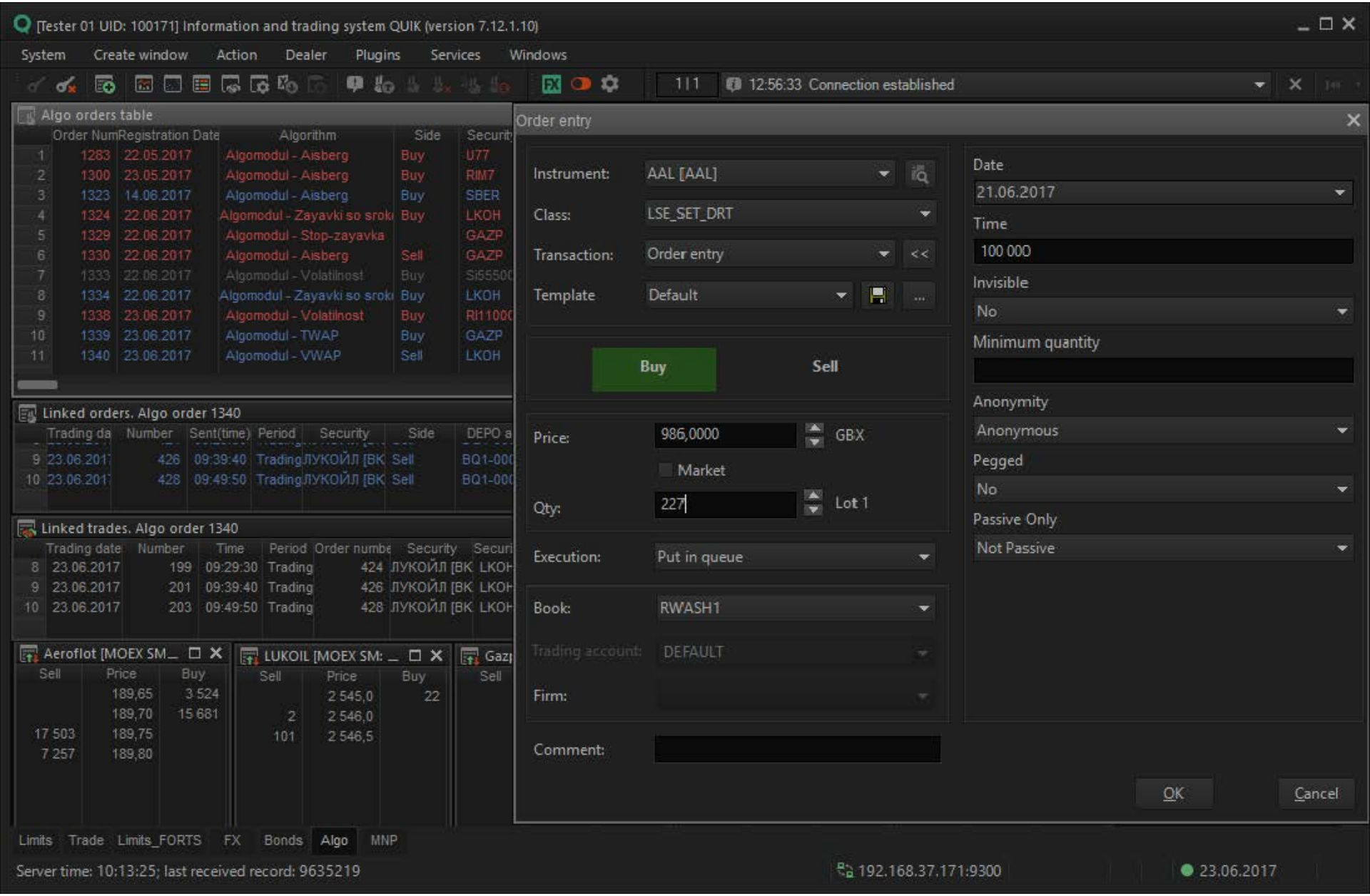
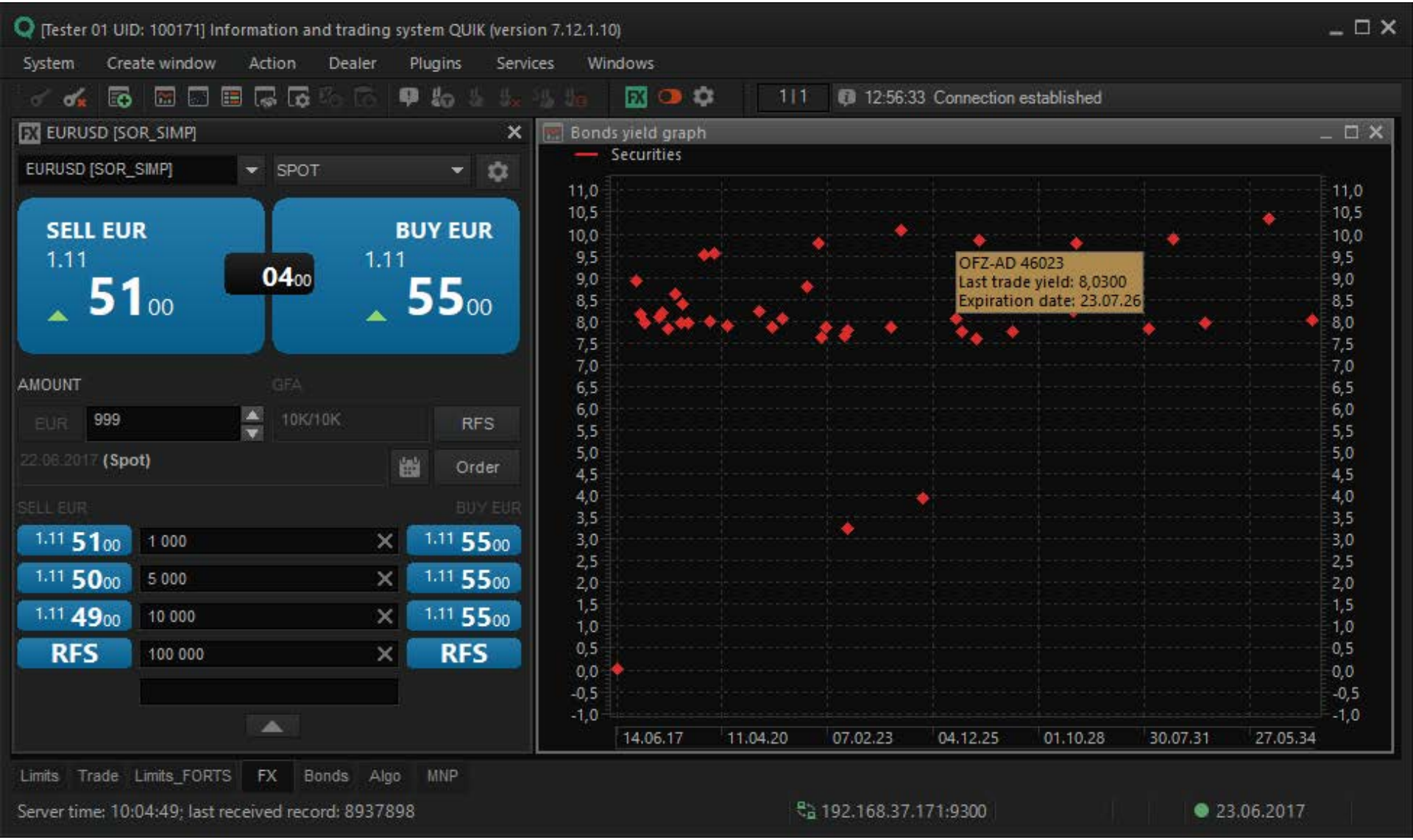
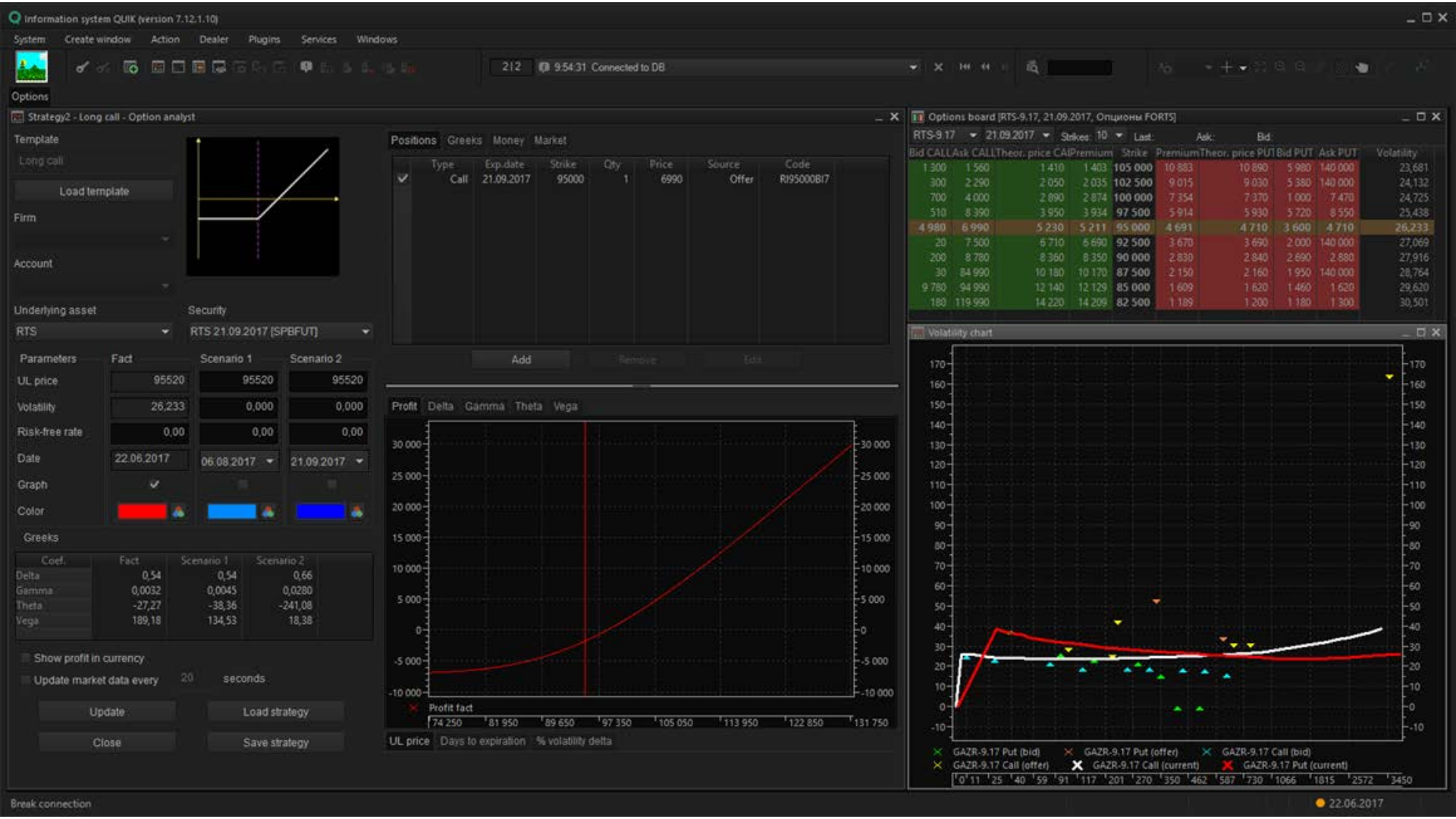
Dissemination layer
SOR
Spreader
ALGO
Business logic modules


Data tier
Application tier
Presentation tier
Application server
Dissemination layer
Exchanges
Feed handlers
Business logic modules
Gateway protocol
User protocol


[Tester 01 UID: 100171] Information and trading system QUIK (version 7.12.1.10)
System
Create window
Action
Dealer
Plugins
Services
Windows
111
12:56:33 Connection established
Algo orders table
Order Num
Registration Date
Algorithm
Side
1 1283 22.05.2017 Algomodul - Aisberg Buy U77
2 1300 23.05.2017 Algomodul - Aisberg Buy RIM7
3 1323 14.06.2017 Algomodul - Aisberg Buy SBER
4 1324 22.06.2017 Algomodul - Zayavki so sroki Buy LKOH
5 1329 22.06.2017 Algomodul - Stop-zayavka GAZP
6 1330 22.06.2017 Algomodul - Aisberg Sell GAZP
7 1333 22.06.2017 Algomodul - Volatilnost Buy Si55500
8 1334 22.06.2017 Algomodul - Zayavki so sroki Buy LKOH
9 1338 23.06.2017 Algomodul - Volatilnost Buy RI11000
10 1339 23.06.2017 Algomodul - TWAP Buy GAZP
11 1340 23.06.2017 Algomodul - VWAP Sell LKOH
Linked orders. Algo order 1340
Trading da
Number
Sent(time)
Period
Security
Side
DEPO a
9 23.06.201 426 09:39:40 Trading ЛУКОЙЛ [BK Sell BQ1-000
10 23.06.201 428 09:49:50 Trading ЛУКОЙЛ [BK Sell BQ1-000
Linked trades. Algo order 1340
Trading date
Number
Time
Period
Order numbe
Security
Securi
8 23.06.2017 199 09:29:30 Trading 424 ЛУКОЙЛ [BK LKOH
9 23.06.2017 201 09:39:40 Trading 426 ЛУКОЙЛ [BK LKOH
10 23.06.2017 203 09:49:50 Trading 428 ЛУКОЙЛ [BK LKOH
Aeroflot [MOEX SM...
Sell
Price
Buy
189,65 3 524
189,70 15 681
17 503 189,75
7 257 189,80
LUKOIL [MOEX SM: ...
Sell
Price
Buy
2 545,0 22
2 546,0
2 546,5
Gazp
Sell
Order entry
Instrument: AAL [AAL]
Class: LSE_SET_DRT
Transaction: Order entry
Template Default
Buy
Sell
Price: 986,0000 GBX
Market
Qty: 227 Lot 1
Execution: Put in queue
Book: RWASH1
Trading account: DEFAULT
Firm:
Comment:
Date
21.06.2017
Time
100 000
Invisible
No
Minimum quantity
Anonymity
Anonymous
Pegged
No
Passive Only
Not Passive
OK
Cancel
Limits
Trade
Limits_FORTS
FX
Bonds
Algo
MNP
Server time: 10:13:25; last received record: 9635219
192.168.37.171:9300
23.06.2017


[Tester 01 UID: 100171] Information and trading system QUIK (version 7.12.1.10)
System
Create window
Action
Dealer
Plugins
Services
Windows
1|1
12:56:33 Connection established
EURUSD [SOR_SIMP]
EURUSD [SOR_SIMP]
SPOT
SELL EUR
1.11
51 00
04 00
BUY EUR
1.11
55 00
AMOUNT
GFA
EUR
999
10K/10K
RFS
22.06.2017 (Spot)
Order
SELL EUR
BUY EUR
1.11 51 00
1 000
1.11 55 00
1.11 50 00
5 000
1.11 55 00
1.11 49 00
10 000
1.11 55 00
RFS
100 000
RFS
Bonds yield graph
Securities
OFZ-AD 46023
Last trade yield: 8,0300
Expiration date: 23.07.26
11,0
10,5
10,0
9,5
9,0
8,5
8,0
7,5
7,0
6,5
6,0
5,5
5,0
4,5
4,0
3,5
3,0
2,5
2,0
1,5
1,0
0,5
0,0
-0,5
-1,0
14.06.17
11.04.20
07.02.23
04.12.25
01.10.28
30.07.31
27.05.34
Limits
Trade
Limits_FORTS
FX
Bonds
Algo
MNP
Server time: 10:04:49; last received record: 8937898
192.168.37.171:9300
23.06.2017


Information system QUIK (version 7.12.1.10)
System
Create window
Action
Dealer
Plugins
Services
Windows
Options
212
9:54:31 Connected to DB
Strategy2 - Long call - Option analyst
Template
Long call
Load template
Firm
Account
Underlying asset
RTS
Security
RTS 21.09.2017 [SPBFUT]
Positions
Greeks
Money
Market
Type
Exp.date
Strike
Qty
Price
Source
Code
Call
21.09.2017
95000
1
6990
Offer
RI95000BI7
Add
Remove
Edit
Parameters
Fact
Scenario 1
Scenario 2
UL price
95520
95520
95520
Volatility
26,233
0,000
0,000
Risk-free rate
0,00
0,00
0,00
Date
22.06.2017
06.08.2017
21.09.2017
Graph
Color
Greeks
Coef.
Fact
Scenario 1
Scenario 2
Delta
0,54
0,54
0,66
Gamma
0,0032
0,0045
0,0280
Theta
-27,27
-38,36
-241,08
Vega
189,18
134,53
18,38
Show profit in currency
Update market data every
20
seconds
Update
Load strategy
Close
Save strategy
Profit
Delta
Gamma
Theta
Vega
30 000
25 000
20 000
15 000
10 000
5 000
0
-5 000
-10 000
Profit fact
74 250
81 950
89 650
97 350
105 050
113 950
122 850
131 750
UL price
Days to expiration
% volatility delta
Options board [RTS-9.17, 21.09.2017, Опционы FORTS]
RTS-9.17
21.09.2017
Strikes: 10
Last:
Ask:
Bid:
Bid CALL
Ask CALL
Theor. price CALL
Premium
Strike
Premium
Theor. price PUT
Bid PUT
Ask PUT
Volatility
1 300 1 560 1 410 1 403 105 000 10 883 10 890 5 980 140 000 23,681
300 2 290 2 050 2 035 102 500 9 015 9 030 5 380 140 000 24,132
700 4 000 2 890 2 874 100 000 7 354 7 370 1 000 7 470 24,725
510 8 390 3 950 3 934 97 500 5 914 5 930 5 720 8 550 25,438
4 980 6 990 5 230 5 211 95 000 4 691 4 710 3 600 4 710 26,233
20 7 500 6 710 6 690 92 500 3 670 3 690 2 000 140 000 27,069
200 8 780 8 360 8 350 90 000 2 830 2 840 2 690 2 880 27,916
30 84 990 10 180 10 170 87 500 2 150 2 160 1 950 140 000 28,764
9 780 94 990 12 140 12 129 85 000 1 609 1 620 1 460 1 620 29,620
180 119 990 14 220 14 209 82 500 1 189 1 200 1 180 1 300 30,501
Volatility chart
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
GAZR-9.17 Put (bid)
GAZR-9.17 Put (offer)
GAZR-9.17 Call (bid)
GAZR-9.17 Call (offer)
GAZR-9.17 Call (current)
GAZR-9.17 Put (current)
0 11 25 40 59 91 117 201 270 350 462 587 730 1066 1815 2572 3450
Break connection
22.06.2017

Modular approach

Key facts

About 170 modules in all (including legacy), 120 modules in the current pricelist

On average, 20 modules in production pipeline

3 to 5 releases every week

30 development, 15 testing, 15 support staff

Modular approach

General rules of interaction

Specialization

Architectural integrity

Distributed ownership

Immediate request segregation

Modular approach

What contributes to successful testing

Available test environment

exchange simulators

Repeatable conditions

set of options to straighten data flow

Reference results

comparison with previous version

Automatic regression checks

Modular approach

Exceptions

Separate risk modules for each asset class

vs

Single risk module for portfolio margining

ARQA