

A photograph of the Oslo Børsen building, a neoclassical structure with a portico supported by columns. The word 'BØRSEN' is inscribed above the columns. A statue stands on a pedestal in the foreground. The image is overlaid with a teal semi-transparent banner containing text.

Oslo Optiq® Technical User Group

OSLO, STOCKHOLM, LONDON



OSLO BØRS

Mid-January 2020

AGENDA

1. Project Overview

- Migration Timeline
- Technical Specifications / Testing
- Differences between Millennium Exchange / SOLA and Optiq

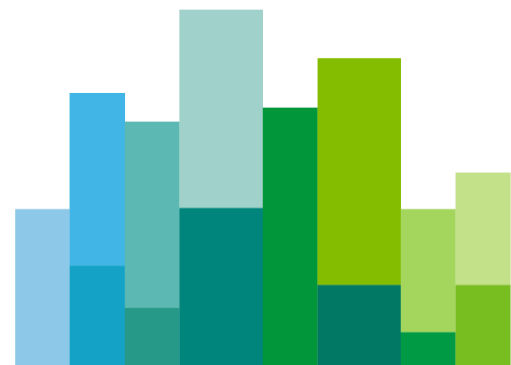
2. Optiq® and Saturn Overview

- Connectivity
- Enablement
- Market Data
- Trade Reporting
- APA
- Record Keeping

3. Clearing

4. Next Steps

PROJECT OVERVIEW



OSLO BORS – MIGRATION TIMELINE – TENTATIVE PLAN

Derivatives

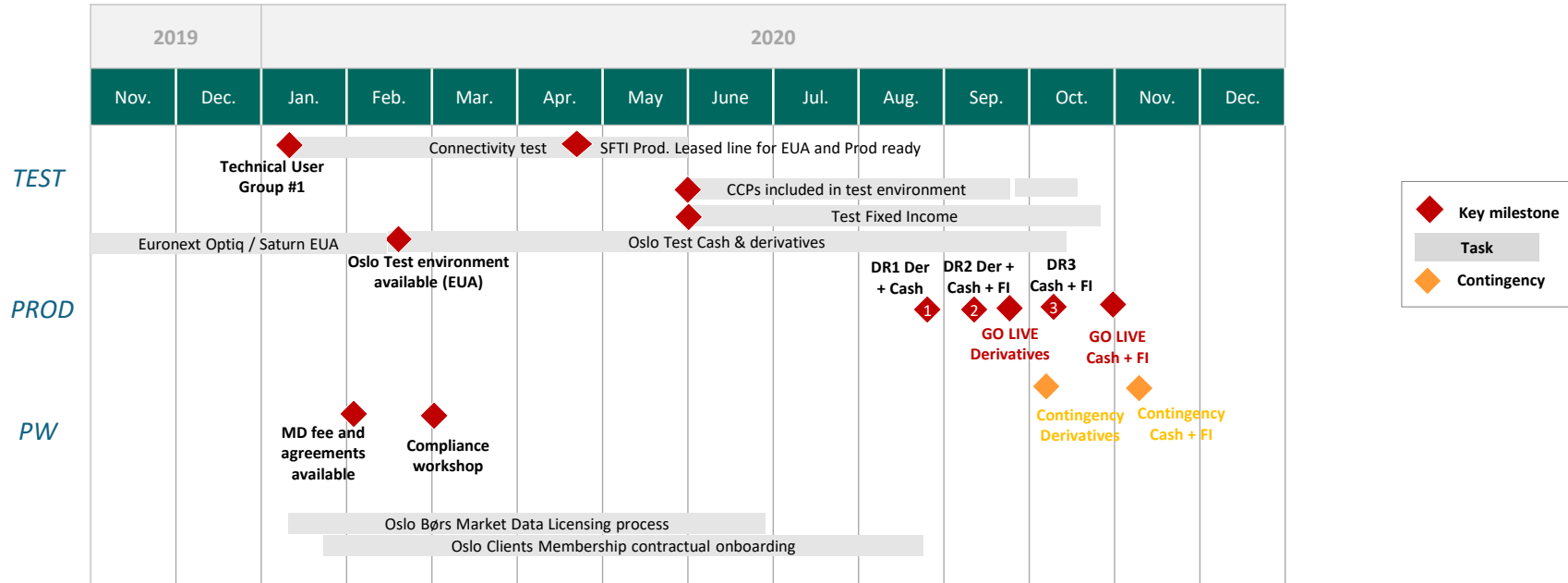
26 September 2020

Cash Equities

31 October 2020

Fixed Income

31 October 2020



• Please note that timeline may be subject to change

TECHNICAL DOCUMENTATION – PROJECT

1. REGISTER AT CONNECT 2:

- <https://connect2.euronext.com/>
- Register for Euronext Info Flash

2. STAY UPDATED VIA DELTA ANNOUNCEMENTS

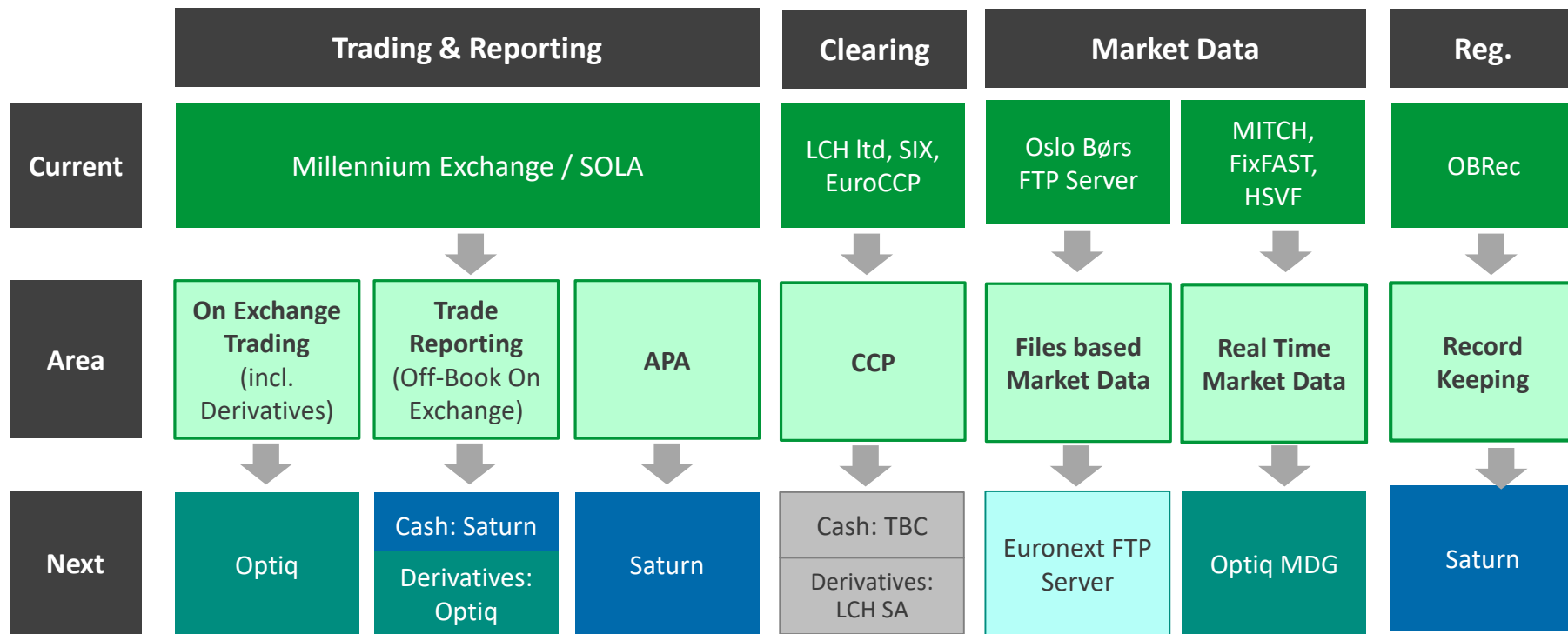
- <https://www.oslobors.no/Oslo-Boers/Handel/Delta/Optig>



3. SUPPORT

- technicalsupport@oslobors.no
- clientsupport@euronext.com








OSLO BORS MIGRATION – MAIN AREAS OF CHANGES



NETWORK CONNECTIVITY

	Oslo	Scandinavia	Continental Europe
Optiq	<ul style="list-style-type: none">▪ FNN	<ul style="list-style-type: none">▪ SFTI Stockholm POP fully available End Q1 / Early Q2 2020▪ VFN? (Under discussion)	<ul style="list-style-type: none">▪ SFTI
LCH SA	<ul style="list-style-type: none">▪ FNN<ul style="list-style-type: none">▪ To be confirmed.	<ul style="list-style-type: none">▪ SFTI<ul style="list-style-type: none">▪ To be confirmed▪ VFN? (Under discussion)	<ul style="list-style-type: none">▪ CMC from LCH<ul style="list-style-type: none">▪ Or via an ACP (Accredited Connectivity Partner)

TEST POLICIES

	Provider	Member in-house	Member using provider
1 Functional Conformance	 Mandatory <ul style="list-style-type: none"> Euronext assistance required (book timeslot on Connect). Conformance policies as for Oslo Børs customers today. 	 Mandatory	 Market Makers: Mandatory (Highly recommended for all)
2 High Availability (HA)	 Mandatory <ul style="list-style-type: none"> Test HA within allocated time slots provided by Euronext. 	 Mandatory	Highly recommended
3 Throttling	Highly recommended	Highly recommended	Highly recommended
4 Front to Back conformance with Clearing partner	N/A	 Mandatory	 Mandatory

KEY DIFFERENCES MILLENNIUM & SOLA / OPTIQ

Reference Data / Conformance

- Reference data
 - Files published early morning

Market Data

- Multicast based Market data
 - A and B stream as today
- Market Data recovery
 - Multicast based
- No «Trade Only» gateway

Disaster Recovery

- Start at secondary site from where we left off

KEY FUNCTIONAL DIFFERENCES / CHANGES

Equities / ETNs / ETFs

- Trading at Last (TAL)
- Best Of Book (BoB)
- Liquidity Provider Programs
- Order Routing Solution
- Euronext Block

- Improved Market Maker Protection for ETNs
- Order types and TIFs
 - StopLoss introduced
 - **GTT and PassiveOnly removed**
- SEP for Liquidity Providers only

Derivatives

- Functionality very similar to that of Equities
- New MIC Code: XOB for derivatives
- Opening uncross at 09:01

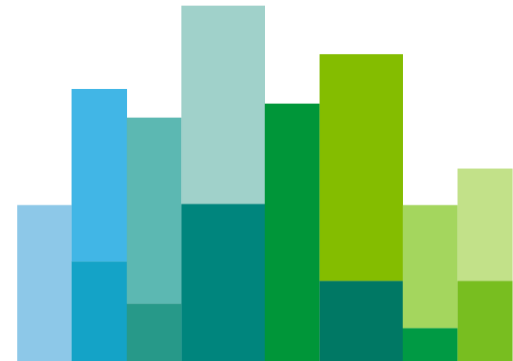
- New solution for Market Maker Protection
- Changes to Market Maker spread obligations
- New trading safeguards

- **Discontinuation of Forwards**
- **Discontinuation of TM derivatives (EDGE)**
- **Discontinuance of MPS Trading Desk / Electronic trading access only**

Fixed Income

- TBD

THE OPTIQ PLATFORM – A REMINDER



THE OPTIQ ARCHITECTURE

The core components

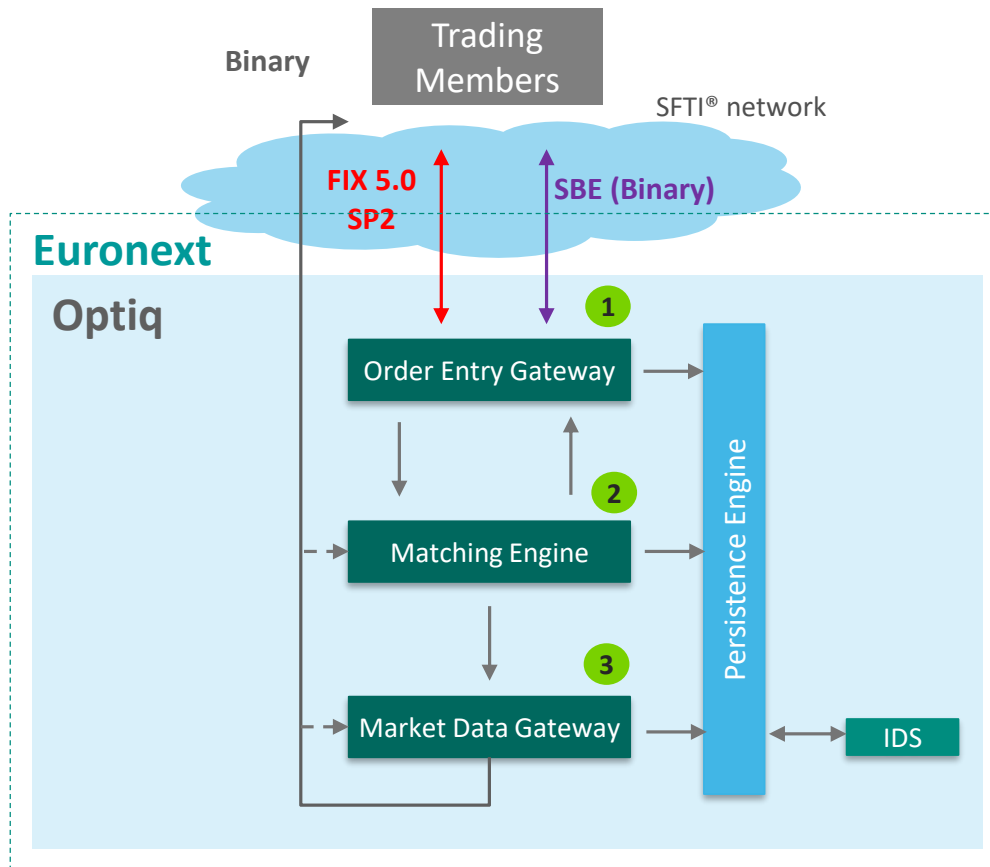
1 The Order Entry Gateway (OEG)

- Two protocols available:
 - FIX 5.0 SP2
 - SBE (Simple Binary Encoding)

2 The Matching Engine (ME)

3 The Market Data Gateway (MDG)

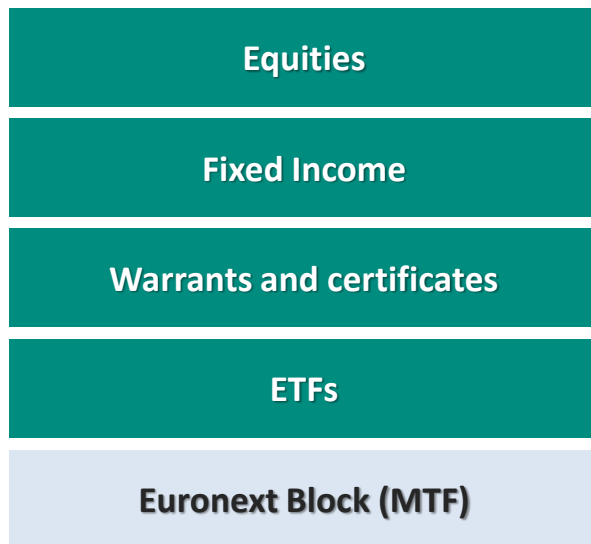
- Market data provided via multicast feed in SBE format



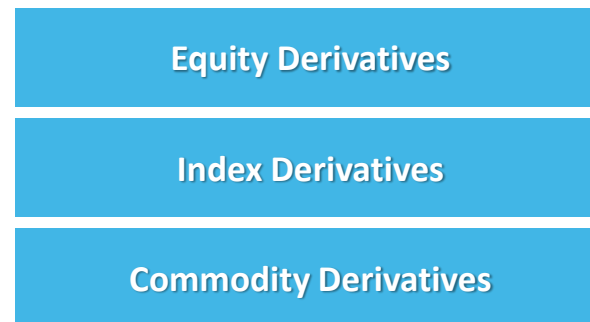
ARCHITECTURE PRINCIPLES

Euronext Segmentation of Cash & Derivatives Markets

EURONEXT CASH SEGMENTS



EURONEXT DERIVATIVES SEGMENTS

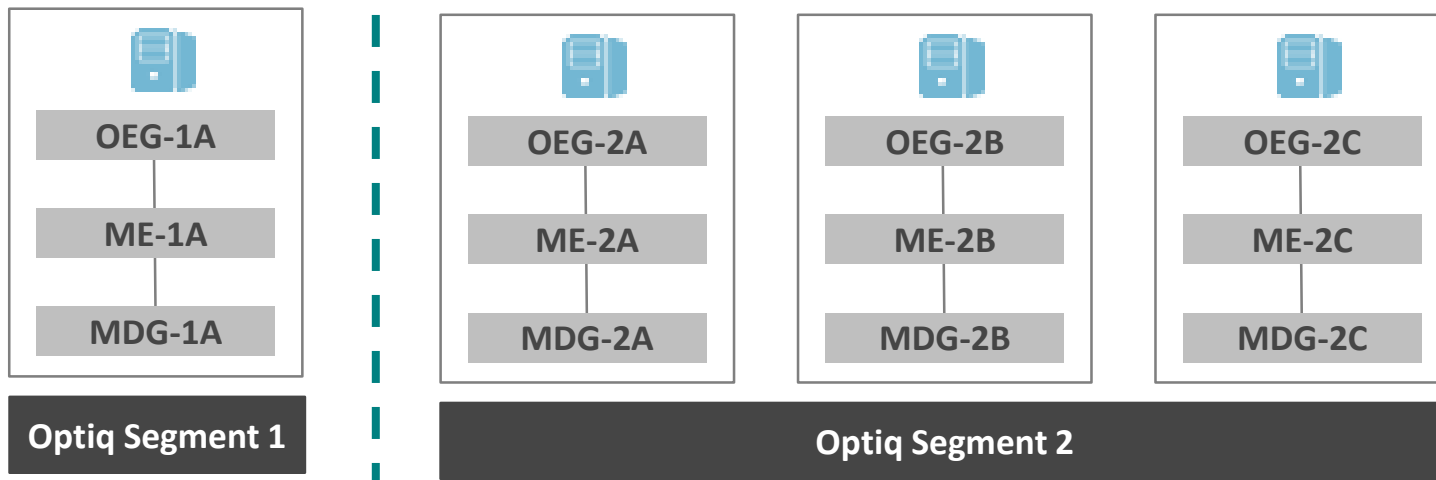


Note that Dublin instruments are included in the Equities & ETFs segments

ARCHITECTURE PRINCIPLES

Partitioning

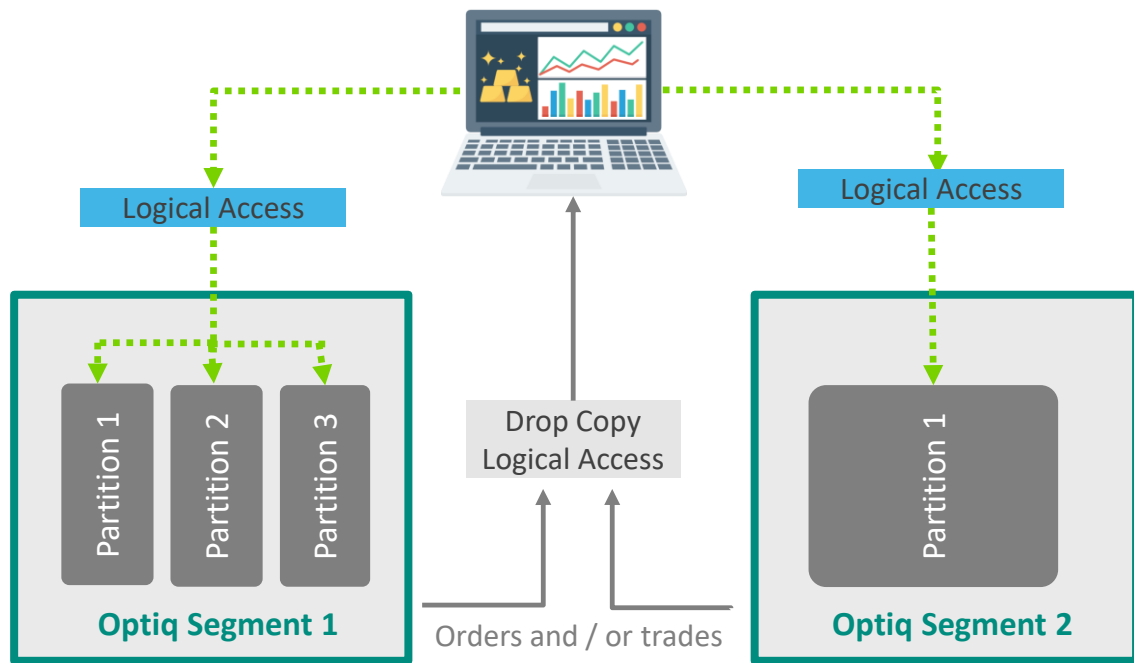
- An **Optiq Partition** is a technical subdivision of an Optiq Segment



Member benefits

- Resilience** - Failures on one partition impact only a fraction of the market/clients
- Scalability** - Simple and seamless scalability model to guarantee stable latency and high performances

THE CONNECTIVITY MODEL (1/2)

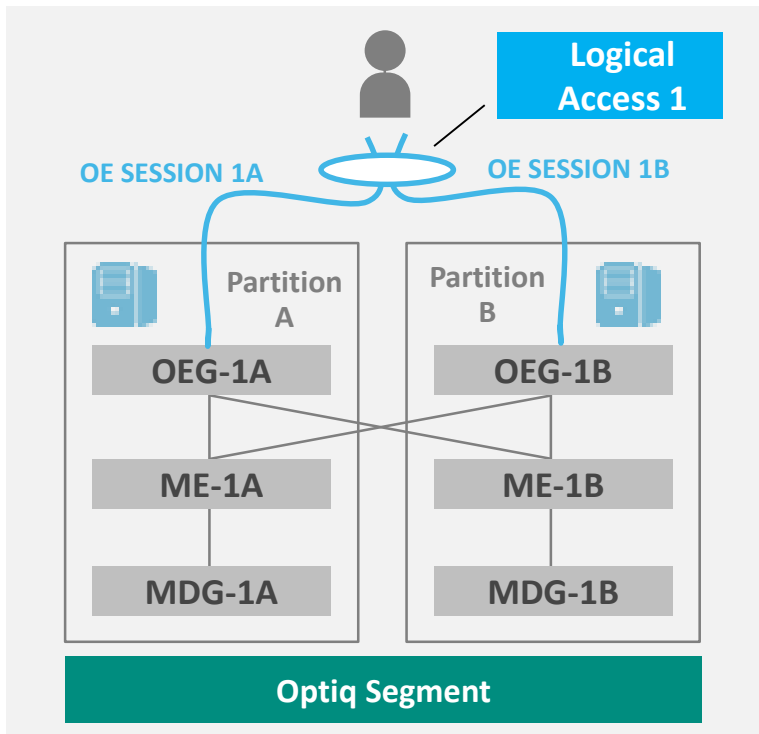


Drop Copy service (via FIX 5.0 API) provides copies of trades and at Trading Member's request orders – Drop Copy Logical Accesses can be cross segments

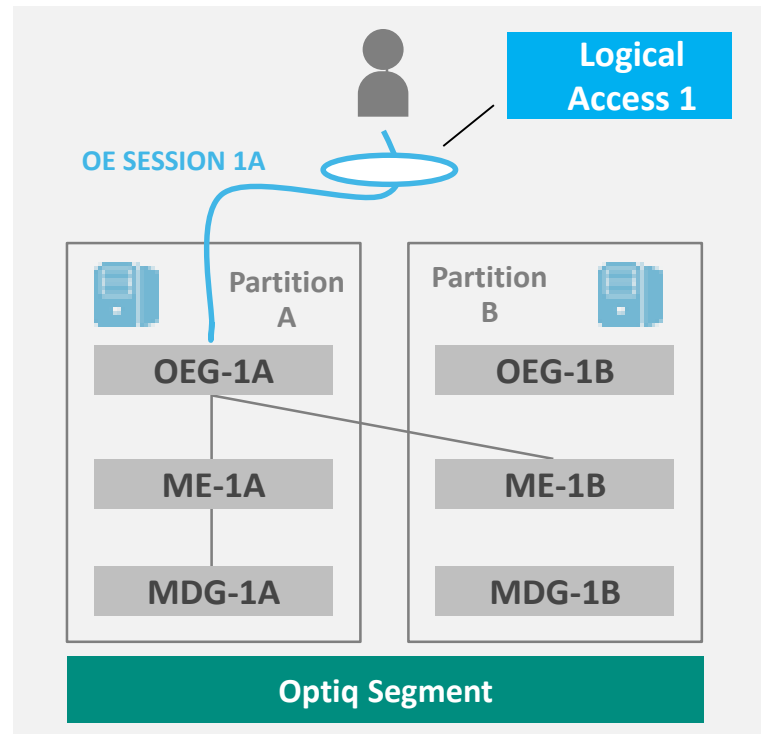
- On Optiq, Customers are provided **Logical Access(es) to an Optiq Segment**
- Logical Accesses provides access to **all partitions** of a Segment
- Customers must have at least **one Logical Access per market segment** for which they have trading authorisations
- Market Makers / Liquidity Providers may get dedicated Logical Accesses

Optiq has the flexibility to load-balance instruments or contracts (for Derivatives markets) across the different partitions of a segment or add a partition to a segment. Customers must therefore refer to the standing data files on a daily basis to get the *PartitionID* of the partition the instrument / contract is listed on.

THE CONNECTIVITY MODEL (2/2)



Customers establish a physical connection to **each** partition of a segment i.e. no cross partitioning

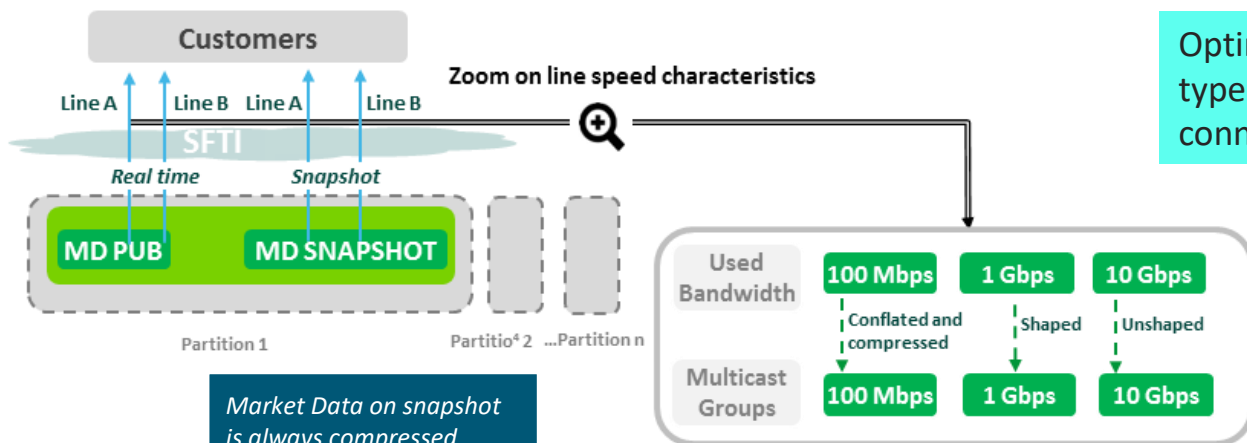


Customers establish a physical connection to **one** partition – orders for instruments on Partition B are routed to ME 1B

FOCUS ON MARKET DATA

Three different delivery mechanisms

- **100 Mb:** Feed is **conflated & compressed** (LZ4). Not all packets are emitted, but only a selection
- **1 Gb:** Feed is **shaped**. Packet emission is controlled.
- **10 Gb:** Feed is **unshaped**. Packet emission is free of controls. Optiq delivers the maximum feed available on a 10 Gb.



Member benefits

Optimized feed for each type of member connectivity

Some 1Gb Shaped channels (Derivatives) might also be compressed
Only BBO available for Derivatives on 100Mb

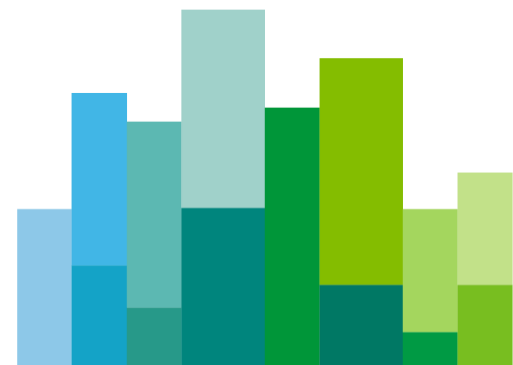
Market Data on snapshot is always compressed

MARKET DATA CHANNELS

- Euronext offers real-time and snapshot Market Data through different channels clients can subscribe to. Channels are split according to the following criteria:
 - For MiFID II requirements: **Asset Class / Country of issue / Currency**
 - **Real-time** and **Snapshot** are sent through different channels

Full Order Book Market Update (FBMU)	Full market by order book depth and BBO
Full Order Book Order Update (FBOU)	Full market by limit book depth and BBO
Best Bid and Offer (BBBO)	Best limits only
Reference Data & Full Trade Information channel (REFT)	Instrument characteristics, scheduled phases, market administration messages and MiFID II compliant trade messages
Reference Data & Index Package channel (REFI)	Instrument characteristics, scheduled phases, market administration messages and Index messages

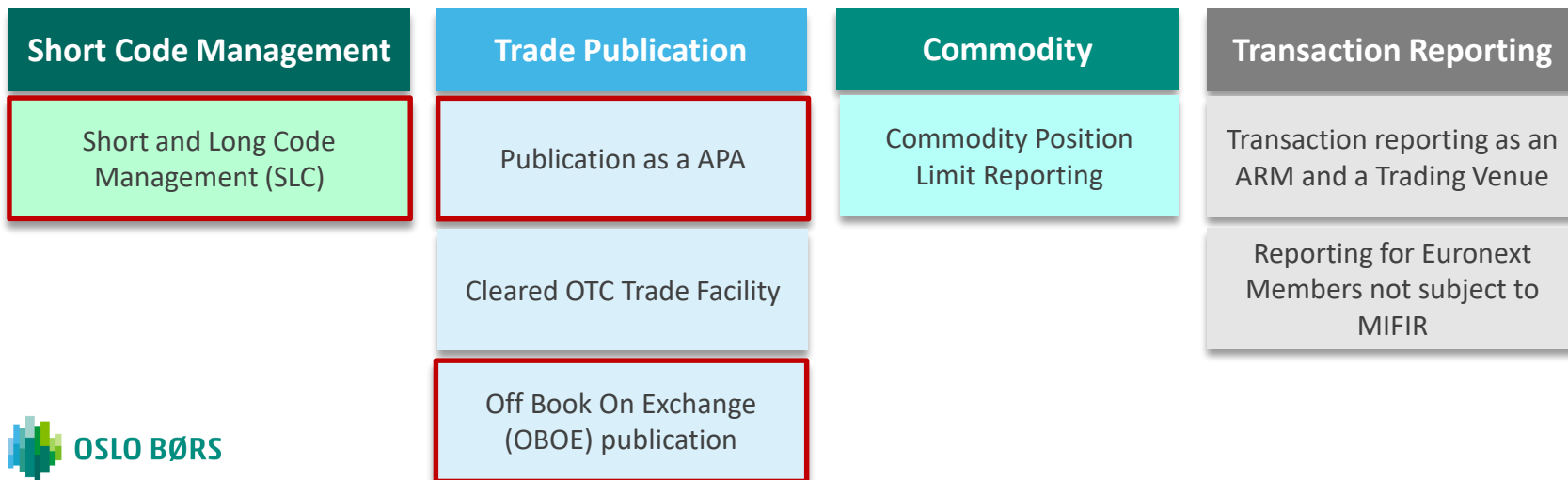
SATURN OVERVIEW – A REMINDER



SATURN GENERAL OVERVIEW

- Euronext global reporting tool built as part of the implementation of MiFID II
- Available to Trading Members as well as non-members of Euronext markets
- Instruments scope covers the ESMA referential and for publication purposes open instruments without ISIN code

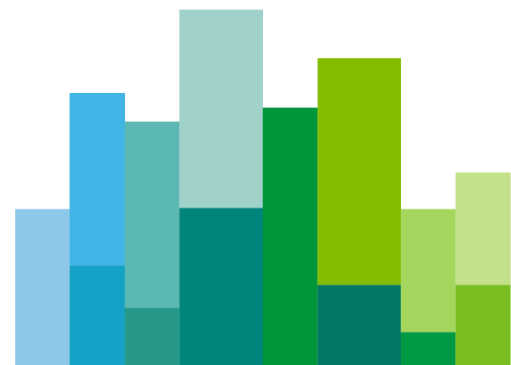
Suite of services provided



IN SUMMARY

- Similar process to the Dublin migration last year
- Connectivity and architecture will stay the same
- It is thought 1 additional partition will be added for Oslo equities
- Capacity monitoring – no need for any additional costs
- New channel for Oslo equities. Everything else will be merged into existing channels
- Saturn will support any OBOE activity

CLEARING



DERIVATIVES CLEARING



OSLO BORS CLEARING SELECTED OPTION (LCH SA) FOR DERIVATIVES MARKET

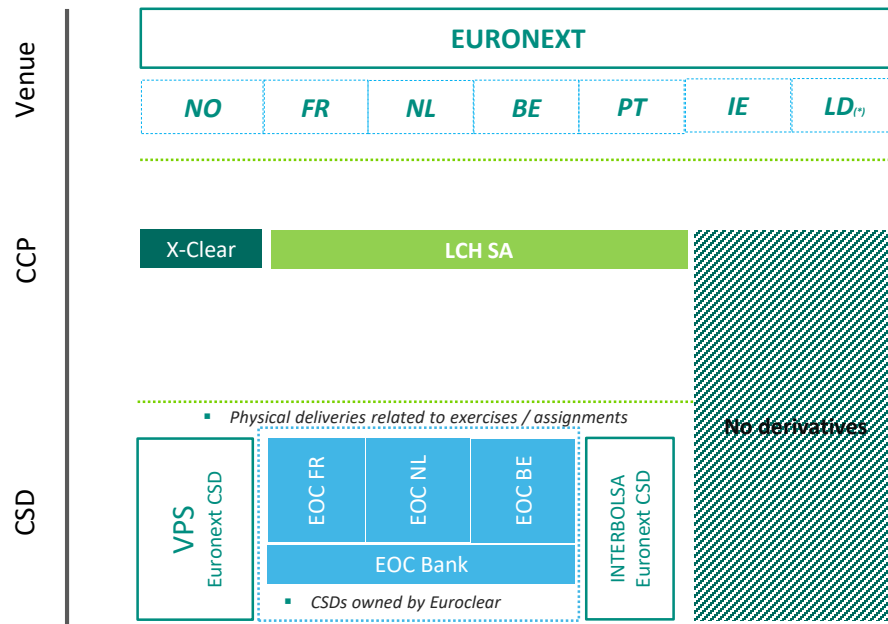
Main drivers

- **Overall consistency** of the post trade set up for clients (single liquidity pool, margining efficiencies)
- **EU27 based CCP** – important in the Brexit context and regular questions around the equivalence with Switzerland
- Strong, safe and long term arrangement between LCH SA and Euronext group
- Preference of international clients for LCH SA versus Six X Clear
- Multi asset classes CCP on derivatives and cash markets with more than **350 Billions of collateral pool & 4 Billions of Default fund** – so most robust CCP in EU27 as to level of resistance to stressed tests conditions

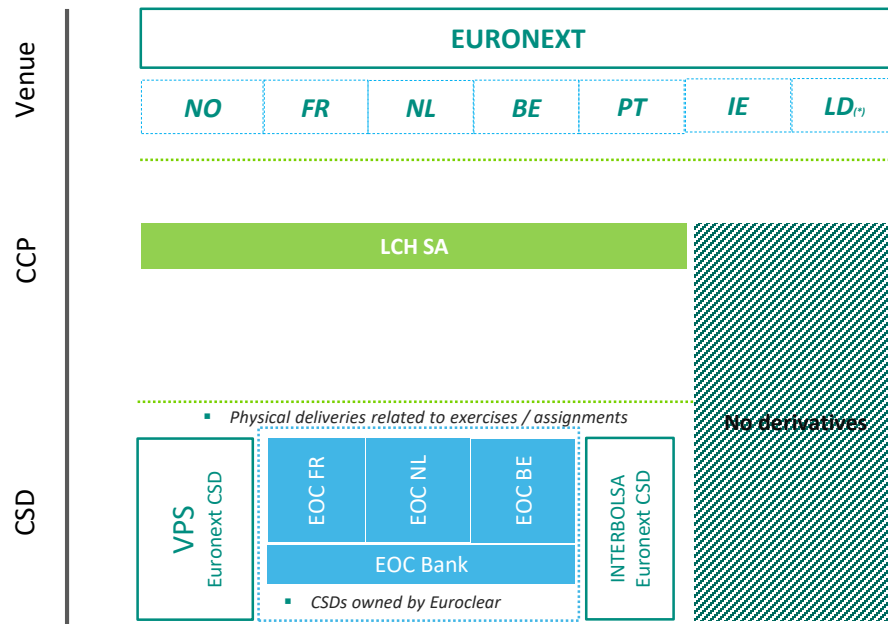
Member benefits

- **Easier onboarding across Euronext segments as market structure including post trade is uniformed**
- **Single CCP for all Euronext derivatives markets, hence only one default fund contribution and potential margining / collateral optimization depending on client profile / set up**

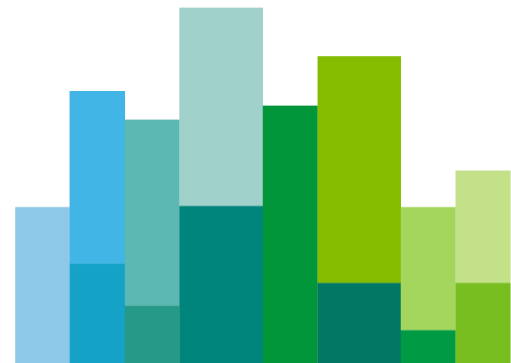
EURONEXT MARKETS – CURRENT DERIVATIVES MARKET STRUCTURE



EURONEXT MARKETS – TARGET DERIVATIVES MARKET STRUCTURE



CLEARING MIGRATION

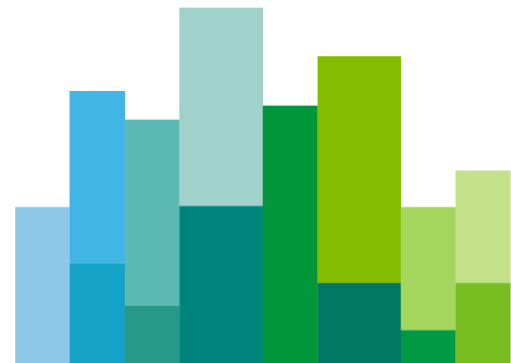


CLEARING MIGRATION

Main principles for Derivatives

- Freeze period of membership/on boarding a couple of weeks prior to the migration
- The current CCP remains responsible and continues to clear trades and corresponding open positions before migration to Optiq
- Transfer of opened derivatives positions between CCPs in the weekend prior to the Optiq migration
- The current CCP services remain in place post migration for the last margin calls and financial settlements as well as potential physical delivery of options exercise & assignments triggered before or at the weekend migration during a period of 10 days to allow for any failed settlement and potential buy-ins
- Clearing arrangements between CM's and the current CCP to cease or be amended as needed when all positions settled. Default fund contribution and Margins to be returned to Members when no unsettled position left

NEXT STEPS



NEXT STEPS

- Register at Euronext Connect (Documentation, Info Flash etc.)
- Request LCH SA technical documentation
- CCP workshop in Oslo and Stockholm in February
- Connect to Optiq test environment as soon as possible
- HEADS-UP – some agreements to be signed
 - EMDA, TPAA, Network etc.
- 1 to 1 sessions as follow-ups during the whole project period

APPENDIX



BECOMING A MEMBER OF LCH SA

Membership criteria for clearing members

- **Regulatory Status and Market capital requirements:** Credit Institution or Investment firm supervised by a competent authority
<https://www.lch.com/membership/sa-membership/membership-sa-legal-and-regulatory-requirements>

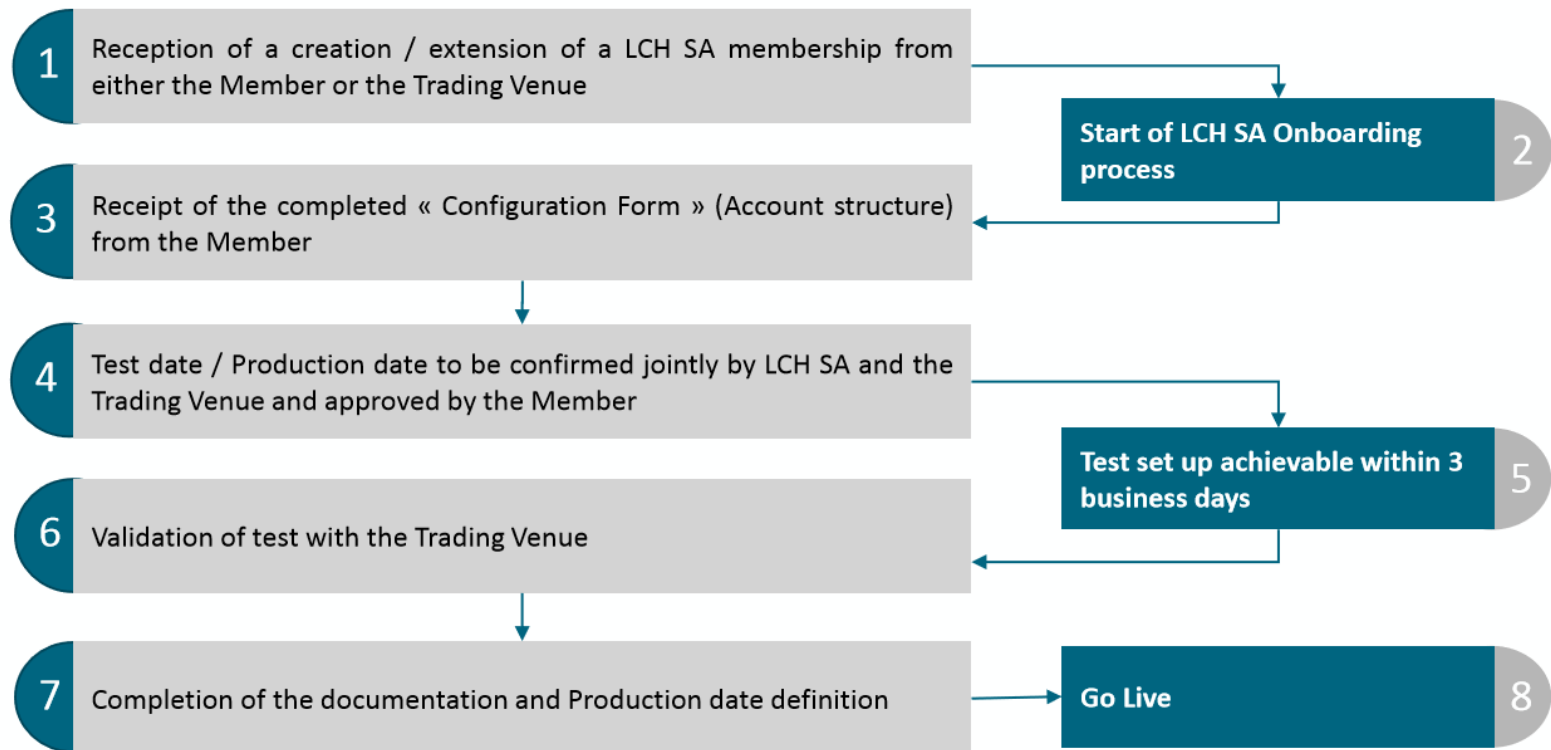
- **Memberships thresholds for EquityClear and CommodityClear**

Depending on the Membership type a Member opt for, a different capital requirement will be required :

Membership	Individual Clearing Member (ICM)	General Clearing Member (GCM)	
Definition	Clearing Member authorized to clear transactions dealt for its own account, or allocated to it or which have been concluded for the account of its Clients / NCM	Clearing Member authorized to clear transactions which have been dealt for its own account, or have been concluded for the account of its Clients and/or Non Clearing Members	
Membership type	<pre> graph TD ICM[ICM] --- House[House] ICM --- Client[Client] </pre>	<pre> graph TD GCM[GCM] --- House[House] GCM --- Client[Client] GCM --- NCM[NCM] GCM --- NCM_dotted[NCM...] </pre>	
Capital Requirement	<p>ICM (+ Clients)</p> <p>€10 million or €5 million + Letter of Credit</p>	<p>GCM (+ 0-9 NCMs)</p> <p>at all times: at least €25 million (or €15 million + a Letter of Credit) up to nine NCM Cleared/Market member</p>	<p>GCM (+ More than 9 NCMs)</p> <p>€30 million from the tenth NCM Cleared/Market Member or €33.75 million from the fifteenth NCM Cleared/Market Member or €37.5 million from the twentieth NCM Cleared/Market Member</p>

BECOMING A MEMBER OF LCH SA

Process of membership request



BENEFITS OF THE OPTIQ PLATFORM



PREMIUM LEVEL PERFORMANCE

Optiq technology Cash and Derivatives markets now harmonized to ensure **reliability, enhanced throughput and predictable latency**



INCREASED EFFICIENCY

Enhanced **efficiency** and **performance** through improved connectivity and protocols, and **optimised messaging model**



FLEXIBILITY

An **access model streamlined across markets**, enhanced for the specific needs of Derivatives market participants, allowing **shorter time-to-market** to deliver new initiatives and implement customers' requests



ARCHITECTURE PRINCIPLES

Optiq Segmentation

- An **Optiq Segment** defines a **universe of instruments** sharing **common trading and financial properties**
- Each segment is independent from the other ones
- A Market Segment gives access to a group of instruments. These instruments may be divided into Partitions

Member benefits

- **Resilience** – Failure of a single Optiq segment has limited technical impacts on other Optiq segments
- **Flexibility** – Possibility of independent software and operational lifecycle

THROTTLING

A predictable and flexible mechanism

- The throttling mechanism ensures **harmonisation** and a **uniform approach** for Cash and Derivatives markets
- Customers can choose whether to **enable the queuing service** or **use the default rejection mechanism** for the messages over the limit
- Optiq provides **queueing of messages** as a service in case throttling is triggered to allow a limited number of messages over the throttling limit. The limit is applied to all messages sent.
- **Each session** has a **maximum number of messages that can be sent based on the throughput chosen by the client** for their accesses.

SATURN GENERAL ARCHITECTURE

Web Service

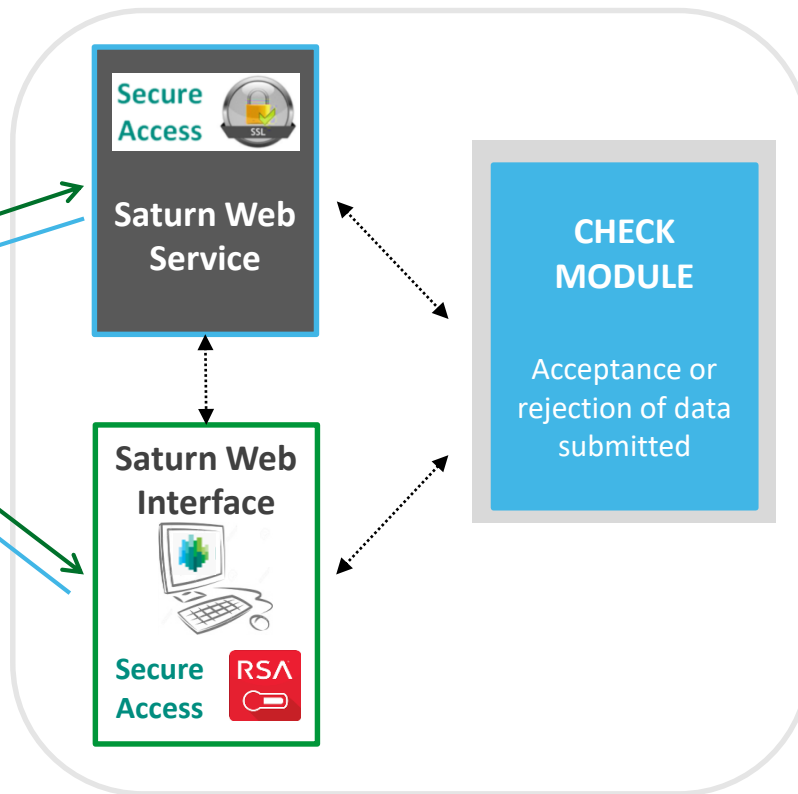
- Security Certificates
- Transport mechanism: HTTPS
- Message format: REST
- Flexible integration thanks to Web REST API supporting multiple formats (JSON, FIX) as well as CSV for upload facility

Euronext
Trading Member
or non-member



Web Interface

- Real-time view of trades / short codes submitted
- Manual edit / correction functions
- Manual CSV upload facility



Trade publication Services

Optiq

M
D
G

TRADE
PUBLICATION

Trade Reporting Services

REGULATORS



Short & long Code
Management

THE SLC MANAGER

- MiFID II Order Record Keeping requirements (RTS 24) requires Trading Venues to be able to supply regulators with a wide range of order-related data.
- The SLC Manager in Saturn is a *mandatory* tool for all Euronext Cash and Derivatives members, allowing them to declare, per Euronext market, the different short codes and the appropriate mapping with the long codes
- Data can be either upload via the REST API or the User Interface or input manually in the User Interface
- Submission of a short long code mapping is only required if there are changes to existing mapping data or if short codes have been used in order entry that have not previously been declared
- Short Long codes mapping can amended / deleted either manually or by uploading a new file

In the event that orders or quotes are submitted with unknown short codes, they will not be rejected. Member's Responsible Persons will be notified at D+1 via a specific report.

OFF BOOK ON EXCHANGE (OBOE) PUBLICATION

- Trade Reporting service currently available only for the submission of MiFID II compliant **Off Book On Exchange trades** in Euronext Oslo and Dublin securities trading on Optiq

- Single-side transactions*

- Price validation** against the latest order book execution price or against the order book spread (for liquid instruments). Failure on price checks would lead to the transaction accepted with a *'Warning'* status.
- If **MiFID II Negotiated Deal pre-trade transparency waiver flags** are not applied correctly based on the liquidity classification of ESMA, the trade report will not be published but stored in OBOE with a *'Failed'* status
- Trade reports are disseminated to the market immediately after they have been accepted
- Amendments / cancellations possible until T+2
- Deferral publication available

Trades can be between:

- A member firm and a non-member firm
- An in-house cross between two counterparties of the member firm
- Two member firms



OSLO BØRS