Cboe Technology Integration Customer Conference Call

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November 13, 2018
Andy Lowenthal, Executive Vice President, Co-Head, Markets Division
• Business update

Chris Isaacson, Executive Vice President, Chief Information Officer
• Technology enhancements to Cboe Options (C1)
• Planned timeline and rollout for C1 migration
• Feature packs across options exchanges

Questions and Answers
• Chris Isaacson
• Andy Lowenthal
• Eric Crampton, Senior Vice President, Global Head of Software Engineering
• Troy Yeazel, Senior Vice President, U.S. Operations
• Anthony Montesano, Vice President, Market Structure and Functionality
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Welcome and Overview

**C1 technology migration planned for October 7, 2019***

- The migration of C1 expected to provide a better trading experience with proven, world-class technology that seamlessly integrates electronic and open outcry trading.
- We plan to provide several resources to help you prepare for the migration including:
  - Customer meetings and discussions
  - Conference calls
  - Regular updates to integration website
  - Multiple testing opportunities
- Team remains focused on executing a seamless technical and operational integration.
- Committed to ensuring you continue to enjoy the same great trading experience and customer service you’ve always had with Cboe Global Markets.
- As we work through the integration, your feedback remains critical, continue to share your opinions, ideas and questions with the Cboe team.

*Pending regulatory approval
Volume surge in October across multiple products and exchanges

Monthly records:
- VIX futures total volume of 9.66 million contracts
- SPX options total volume of 41.4 million contracts
- SPX Weeklys ADV of 1.2 million contracts
- CFE, C2 Options and EDGX Options Exchanges total monthly volume

Trading in SPX options is up roughly 25 percent year-to-date (through end of October) from the same period last year

In heightened volatility environment, Bats technology performed exceptionally well in both regular and global trading hours sessions
Remain focused on our commitments to product innovation, seamless trading solutions and leading-edge technology

- This fall, CFE began listing for trading Cboe® iBoxx® iShares® $ High Yield Corporate Bond Index (IBHY) futures and Cboe® iBoxx® iShares® $ Investment Grade Corporate Bond Index (IBIG) futures
  - These corporate bond futures allow users to hedge and mitigate corporate bond credit risk, to efficiently allocate to the corporate bond market and implement fixed-income trading strategies
- This month, we hosted our first Cboe RMC Tel Aviv, with approximately 150 attendees
  - We look forward to Cboe RMC Asia next month and our full schedule of RMCs in 2019
- We encourage your engagement with our team throughout the migration process – the new quoting interface feature pack is a direct result of our conversations with you
Technology Enhancements to C1

Migration of SPX to Hybrid completed in April 2018

- The Hybrid market model is being built into Bats technology, but the market model for AM-settled SPX options (Hybrid 3.0) was not replicated as part of this effort
- Cboe retired the Hybrid 3.0 model and transitioned the AM-settled SPX options onto the Command system’s Hybrid platform
- SPX Market Makers have been able to stream their own electronically accessible quotes and the book is now open to all market participants
- Initial results have been very encouraging:
  - Vast majority of Market Makers are streaming quotes electronically
  - Quote widths have narrowed by over 60%
  - Displayed size has more than doubled
Introduction of the redesigned PAR 2.0 began in October 2018

- In advance of the full C1 migration to Bats technology, Cboe is introducing redesigned PAR workstations in two phases – PAR 2.0 and PAR 3.0
- PAR 2.0 will interface with the legacy Command system to prepare the PAR 3.0 interface for connecting to Bats technology once full C1 migration is completed

**Rollout - Phase 1**
- Began last month, on target to complete by year-end
- Incorporates new UX and functionality to interact with legacy Command system
- Legacy PAR and PAR 2.0 will run in parallel until legacy PAR is decommissioned
- Product demonstration and opportunities to interact with PAR 2.0 are available at the Reporting Desk at Post 10 throughout rollout period

**Rollout - Phase 2**
- PAR 3.0 will interact with Bats technology and incorporate exchange platform changes to enhance order handling and market data delivery to PAR
- Expected completion date will be ultimate C1 migration date of October 7, 2019*

* Pending regulatory approval
C1 Migration: Planned Timeline and Rollout Schedule

- **November 16 (this Friday):** technical specifications available for the C1 migration
- To unify our options functionality across our four options platforms, we plan to introduce a total of nine feature packs:
  - Entitlements/reserve orders
  - Quoting interface
  - Electronic Secure Web API for post trades
  - Market data
  - Simple order auctions
  - All-or-None (AON) orders
  - Global trading hours/opening process
  - Complex crossing
  - Complex with stock legs
- The certification environment for the first two feature packs is already available
- **November 29, 2018**: production rollout for feature pack one
- **January 17, 2019**: production rollout for feature pack two

* Pending regulatory approval
New physical connections to the C1 platform will be accepted at either 1G or 10G

- **February 1, 2019**: new physical connections to the C1 platform accepted
  - C1 will have dedicated network infrastructure and customer connections
- **March 4, 2019**: kick off TPH certification testing
  - To ensure readiness for migration, all C1 TPHs and vendors/ISVs must certify to the new platform
- **April 1, 2019**: logical order entry sessions created in new production environment
- **April 2, 2019**: review logical ports existing on the new platform
- **May 6, 2019**: daily production testing with test symbols begins
- **October 7, 2019**: fees assessed for all order entry and DROP logical ports
  - Firms should work with the Cboe Trade Desk to ensure DROP lines are set up to DROP the expected data

*Pending regulatory approval*
Five weekend tests planned in the new C1 production environment

- **May 6, 2019**: testing with test symbols available in new C1 production environment

**Weekend test dates:**

- June 15, 2019
- July 27, 2019
- August 24, 2019
- September 14, 2019
- **October 5, 2019** (the final Saturday before migration)

- OPRA will participate in each weekend test
- OCC intends to participate in weekend testing
- Customers should plan to participate in as many weekend tests as possible
- **October 7, 2019**: C1 migration date, hard cut-over and legacy platform will be shut off; there will be no parallel period

* Pending regulatory approval
Feature pack one bundles enhancements to DPM entitlements and reserve orders

Features:

- DPM small order entitlement allocation
- Implementation of reserve and complex reserve orders
- Implementation of new EFID group risk control
- OCC customer ID and clearing member optional data field mapping
- New sell market orders in no bid series behavior

- Testing for feature pack one in the BZX, C2 and EDGX options certification environments is already available

- **November 29, 2018**: launch to production

* Pending regulatory approval
C1 Migration: Feature Pack Two

Feature pack two bundles enhancements related to the quoting interface

Features:

• New BOE Quote Update message will be introduced, allowing firms to submit up to 20 updates via a single message on BZX, C2 and EDGX Options Exchanges
• Will replace the current BOE Bulk Update message, which sends individual messages to the Matching Engine from the order gateway
• New risk reset functionality

✧ Testing already available in the BZX, C2 and EDGX options certification environments
✧ **January 17, 2019**: BOE Quoting messages available on EDGX
✧ **January 25, 2019**: BOE Quoting messages available on BZX and C2
✧ **March 29, 2019**: existing Bulk Order message deprecated in favor of Quote Updates

* Pending regulatory approval
Feature packs three and four introduce electronic Secure Web API and material market data changes

**Feature pack three:**
- Will introduce an electronic Secure Web API for post-trade edits

**Feature pack four:**
- Will include all material market data changes

- Certification and production dates for remaining feature packs will be announced via Trade Desk notices
- More information on each of the feature packs will be available on each Trade Desk notice
- Refer to the Integration Website for all of the latest information
Integration website is home for all resources related to C1 migration

- Technical specifications (posted this Friday)
- Comprehensive FAQ
- Planned migration timeline
- Platform change matrix
- Downloadable implementation guides
- Information on customer calls – previous and upcoming

batsintegration.cboe.com/c1
11 months to prepare for C1 migration to Bats technology

- Foundation to migration being laid with enhancements to C1 marketplace
- PAR 2.0 rollout on track to complete by year-end
- Nine feature packs rolling out now through the third quarter of 2019
- Technical specifications posted by November 16 (this Friday)
- Physical connectivity to new C1 platform available February 1, 2019
- TPH certification testing available March 4, 2019
- Production testing with test symbols begins May 6, 2019
- Weekend test opportunities begin June 15, 2019
- Planned migration for C1 is October 7, 2019*
- For all information, visit: batsintegration.cboe.com/c1

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Q&A