SECURITIES AND EXCHANGE COMMISSION
(Release No. 34-97627; File No. SR-BX-2023-014)

May 31, 2023

Self-Regulatory Organizations; Nasdaq BX, Inc.; Notice of Filing and Immediate Effectiveness of Proposed Rule Change to Establish Fees for Field-Programmable Gate Array Technology as an Optional Delivery Mechanism for BX TotalView

Pursuant to Section 19(b)(1) of the Securities Exchange Act of 1934 ("Act")[1], and Rule 19b-4 thereunder,[2] notice is hereby given that on May 23, 2023, Nasdaq BX, Inc. ("BX" or "Exchange") filed with the Securities and Exchange Commission ("SEC" or "Commission") the proposed rule change as described in Items I, II, and III below, which Items have been prepared by the Exchange. The Commission is publishing this notice to solicit comments on the proposed rule change from interested persons.

I. Self-Regulatory Organization's Statement of the Terms of Substance of the Proposed Rule Change

The Exchange proposes to set fees for the purchase of field-programmable gate array ("FPGA") technology as an optional delivery mechanism for BX TotalView.

The text of the proposed rule change is available on the Exchange's Website at https://listingcenter.nasdaq.com/rulebook/bx/rules, at the principal office of the Exchange, and at the Commission's Public Reference Room.

II. Self-Regulatory Organization's Statement of the Purpose of, and Statutory Basis for, the Proposed Rule Change

In its filing with the Commission, the Exchange included statements concerning the purpose of and basis for the proposed rule change and discussed any comments it received on the proposed rule change. The text of these statements may be examined at the places specified in

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1 15 U.S.C. 78s(b)(1).

2 17 CFR 240.19b-4.

Item IV below. The Exchange has prepared summaries, set forth in sections A, B, and C below, of the most significant aspects of such statements.

A. Self-Regulatory Organization's Statement of the Purpose of, and Statutory Basis for, the Proposed Rule Change

1. Purpose

The purpose of the proposed rule change is to establish a fee schedule for the purchase of field-programmable gate array ("FPGA") technology as an optional delivery mechanism for BX TotalView. This follows a recently-filed proposal to offer FPGA technology as an optional delivery mechanism for BX TotalView.[3]

FPGA

FPGA is a hardware-based delivery mechanism that utilizes an integrated circuit that is programmed to reduce "jitter"—a technical term of art referring to the deviation in amplitude, phase timing or width of a signal pulse in a digital signal—that will allow data to be processed in a more predictable, or "deterministic," fashion. Higher levels of determinism means less variable queuing, which improves the predictability of data transfer, particularly during times of peak market activity.

The benefits of determinism depend on the use case of the customer—in general, customers that process larger amounts of data at higher frequencies seek a greater degree of determinism—as well as the specific system architecture used by the customer.

[3] See SR-BX-2023-011 ("A proposal to offer field-programmable gate array ('FPGA') technology as an optional delivery mechanism for BX TotalView."), available at https://listingcenter.nasdaq.com/rulebook/BX/rulefilings. A proposal to establish a fee schedule for the use of FPGA technology for the Phlx exchange is being filed concurrently with this proposal.

Among customers that seek a higher degree of determinism, the benefits of FPGA technology varies, as FPGA technology is one possible solution, among a catalog of possible solutions, for increasing the consistency and predictability of message throughput over the course of the trading day. Some customers are able to adequately control jitter without using FPGA technology; other customers address jitter using specialized software, coding or other design solutions in conjunction with FPGA; still others use FPGA alone. The specific choice depends on a complex analysis of the customer's information technology systems in the context of their particular use cases.

FPGA is a broadly-available, commonly-used type of programmable circuit that can be modified to suit different use cases. It is used in a wide spectrum of industries, including the consumer electronics, automotive, and aerospace, as well as in a variety of industrial applications. It is not unique to the financial services industry,[4] or to Nasdaq.

[4] See, e.g., Contrive Datum Insights, "Field-Programmable Gate Array (FPGA) Market is expected to reach around USD 22.10 Billion by 2030, Grow at a CAGR of 15.12% during Forecast Period 2023 to 2030," (February 21, 2023), available at https://www.globenewswire.com/en/news-release/2023/02/21/2612772/0/en/Field-Programmable-Gate-Array-FPGA-Market-Is-Expected-To-Reach-around-USD-22-10-Billion-by-2030-Grow-at-a-CAGR-Of-15-12-during-Forecast-Period-2023-To-2030-Data-By-Contrive-Datum-I.html (describing the general size and state of the FPGA market in 2023).

FPGA technology has been offered by the Nasdaq Stock Exchange for over a decade, and the Nasdaq Options Market for nearly as long,[5] and has been cited by the SEC as an example of a technology useful in the distribution of market data products.[6]

The Exchange proposes to offer FPGA technology in conjunction with the Exchange's depth of book feed, BX TotalView. BX TotalView is a real-time market data product that provides full order depth using a series of order messages to track the life of customer orders in the BX market, as well as trade data for BX executions and administrative messages such as Trading Action messages, Symbol Directory, and Event Control messages.[7]

Proposed Fees

BX proposes internal distribution fees of $3,500 per month and external distribution fees of $350 for FPGA hardware; customers that elect to use FPGA hardware for both internal and external distribution will pay both fees.[8] These fees are in addition to Market Data Distributor

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5 See Securities Exchange Act Release No. 67297 (June 28, 2012), 77 FR 39752 (July 5, 2012) (SR-Nasdaq-2012-063) (introducing FPGA technology); see also Nasdaq Data News 2012-13, available at http://www.nasdaqtrader.com/TraderNews.aspx?id=dn2012-13 (introducing TotalView FPGA service as of August 1, 2012); Securities Exchange Act Release No. 74745 (April 16, 2015), 80 FR 22588 (April 22, 2015) (SR-Nasdaq-2015-035) (establishing FPGA for the Nasdaq Options Market); The Nasdaq Stock Market LLC Rules, Equity 7, Section 126(c) (Hardware-Based Delivery of Nasdaq Depth data).

6 See Securities Exchange Act Release No. 90610, 86 FR 18596, 18647 (April 9, 2021) (File No. S7-03-20) (listing field programmable gate array services as an example of a technological innovation that could be employed by competing consolidators as part of the Market Data Infrastructure rule).

7 See Nasdaq BX, Inc. Rules, Equity 7, Section 123 (BX TotalView); see also Securities Exchange Act Release No. 59307 (January 28, 2009), 74 FR 6069 (February 4, 2009) (establishing fees for BX TotalView).

8 The difference in amount for external and external distribution reflects Nasdaq's experience that the Exchange's FPGA hardware is best employed at the point of ingestion, as the utility of FPGA technology falls as the data moves farther from the source.

Fees,[9] fees for BX TotalView,[10] and other fees for Distribution Models.[11] Customers that elect to receive BX depth of book data without using FPGA technology will pay no fee in addition to the underlying fees listed above.

The proposed fees are substantially lower than FPGA fees for the Nasdaq exchange, which are set at $25,000 per Distributor for internal only distribution, $2,500 for external only, and $27,500 for internal and external distribution.[12] The difference is based, in part, on a comparison of peak activity at the two exchanges. As noted above, high levels of determinism are particularly valuable during periods of peak activity.

Although there is considerable variation in the number of messages at various peaks, as well as the duration of peak activity, the proposed fees are roughly comparable to the differences in average peak activity at the BX exchange relative to the Nasdaq exchange. Exchange staff have also discussed the proposed fees with customers, and believe, based on those discussions and their own business judgment, that the proposed fees fairly reflect the value of FPGA technology for the BX exchange. A number of customers provisionally agree with this assessment, and have indicated that they are interested in testing it.

No other exchange currently offers FPGA technology as a separate service in conjunction with the delivery of a proprietary data feed, and therefore there are no other fees for comparison. If BX is incorrect in its determination that the proposed fees reflect the underlying value of FPGA technology, customers will not purchase the product. FPGA technology is not necessary

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9 See Nasdaq BX, Inc. Rules, Equity 7, Section 119.

10 See Id., Section 123.

11 See Id., Section 126.

12 See The Nasdaq Stock Market LLC Rules, Equity 7 (Pricing Schedule), Section 126(c) (Hardware-based delivery of Nasdaq depth data).

for a customer to ingest and process depth of book information, and those customers that seek a higher degree of determinism have a number of options at their disposal to reduce jitter without using FPGA.

2. Statutory Basis

The Exchange believes that its proposal is consistent with Section 6(b) of the Act,[13] in general, and furthers the objectives of Sections 6(b)(4) and 6(b)(5) of the Act,[14] in particular, in that it provides for the equitable allocation of reasonable dues, fees and other charges among members and issuers and other persons using any facility, and is not designed to permit unfair discrimination between customers, issuers, brokers, or dealers.

The proposed changes to the pricing schedule are reasonable in several respects. As a threshold matter, the Exchange is subject to significant competitive forces in the market for order flow, which constrains its pricing determinations. The fact that the market for order flow is competitive has long been recognized by the courts. In NetCoalition v. Securities and Exchange Commission, the D.C. Circuit stated, "[n]o one disputes that competition for order flow is 'fierce.' … As the SEC explained, '[i]n the U.S. national market system, buyers and sellers of securities, and the broker-dealers that act as their order-routing agents, have a wide range of choices of where to route orders for execution'; [and] 'no exchange can afford to take its market share percentages for granted' because 'no exchange possesses a monopoly, regulatory or otherwise, in the execution of order flow from broker dealers'…."[15]

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13 15 U.S.C. 78f(b).

14 15 U.S.C. 78f(b)(4) and (5).

15 See NetCoalition, 615 F.3d at 539 (D.C. Cir. 2010) (quoting Securities Exchange Act Release No. 59039 (December 2, 2008), 73 FR 74770, 74782-83 (December 9, 2008) (SR-NYSEArca-2006-21)).

The Commission and the courts have repeatedly expressed their preference for competition over regulatory intervention to determine prices, products, and services in the securities markets. In Regulation NMS, while adopting a series of steps to improve the current market model, the Commission highlighted the importance of market forces in determining prices and SRO revenues, and also recognized that current regulation of the market system "has been remarkably successful in promoting market competition in its broader forms that are most important to investors and listed companies."[16]

Congress directed the Commission to "rely on 'competition, whenever possible, in meeting its regulatory responsibilities for overseeing the SROs and the national market system.'"[17] As a result, the Commission has historically relied on competitive forces to determine whether a fee proposal is equitable, fair, reasonable, and not unreasonably or unfairly discriminatory. "If competitive forces are operative, the self-interest of the exchanges themselves will work powerfully to constrain unreasonable or unfair behavior."[18] Accordingly, "the existence of significant competition provides a substantial basis for finding that the terms of an exchange's fee proposal are equitable, fair, reasonable, and not unreasonably or unfairly discriminatory."[19] In its 2019 guidance on fee proposals, Commission staff indicated that they would look at factors beyond the competitive environment, such as cost, only if a "proposal lacks

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16 See Securities Exchange Act Release No. 51808 (June 9, 2005), 70 FR 37496, 37499 (June 29, 2005) ("Regulation NMS Adopting Release").

17 See NetCoalition, 615 F.3d at 534-35; see also H.R. Rep. No. 94-229 at 92 (1975) ("[I]t is the intent of the conferees that the national market system evolve through the interplay of competitive forces as unnecessary regulatory restrictions are removed.").

18 See Securities Exchange Act Release No. 59039 (December 2, 2008), 73 Fed. Reg. 74,770 (December 9, 2008) (SR-NYSEArca-2006-21).

19 Id.

persuasive evidence that the proposed fee is constrained by significant competitive forces."[20]

Substitutes for FPGA Technology

No customer is required to purchase FPGA technology for either legal or technological reasons—even a customer that seeks to reduce jitter.[21] Indeed, a majority of Nasdaq depth customers are not concerned with jitter because they do not process information at sufficiently high speeds for jitter to become a concern. These customers can continue to ingest BX TotalView as they do now.

Customers searching for greater determinism have an array of options for optimizing their systems. The benefits of selecting any particular option depend on a number of factors, including, but not limited to, the design of the customer's information system architecture, how its computer code is written, the types of hardware it uses to process information, and the cost of each option.

To illustrate the choice faced by exchange customers, consider the decisions made by the two consolidated data processors, the UTP and CTA Plans, two different systems that use dissimilar means to achieve an optimal solution. Both perform the same task—combining quotes and trades from all US exchanges into a consolidated data feed with relatively low jitter. Yet only one processor—the CTA Plan—uses FPGA hardware, while the other—the UTP Plan—does not.

This is because the UTP Plan's design, coding and hardware achieve the desired level of

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20 See U.S. Securities and Exchange Commission, "Staff Guidance on SRO Rule filings Relating to Fees" (May 21, 2019), available at https://www.sec.gov/tm/staff-guidance-sro-rule-filings-fees.

21 Not all customers of depth of book information process at sufficiently high speeds for jitter to become a concern. Neither FPGA hardware nor its substitutes are required to ingest depth of book information.

determinism without FPGA technology. The CTA Plan, by contrast, elected to incorporate FPGA technology into its system design. Notwithstanding these different design decisions, both plans achieve broadly similar levels of performance. FPGA technology is therefore not essential to addressing jitter, but rather is one option among many to address the issue.

Market data customers face an array of choices to optimize determinism, much like the UTP and CTA Plans. For example, a customer may purchase and deploy its own FPGA hardware, without purchasing the proposed FPGA technology service from the Exchange, *after* receiving data from the Exchange. Another customer may find use of the Exchange's FPGA technology, which lowers the level of jitter prior to the customer's receipt of the data, to be a better fit for its system architecture. The solution chosen will vary based on the needs and design choices of the customer.

The experience of the Nasdaq exchange in offering FPGA technology shows that customers sensitive to jitter often avail themselves of substitutes for FPGA technology, a decision that can change over time. Over the past decade, a total of 21 current or potential users of FPGA technology—all of which required high degrees of determinism—substituted FPGA with an alternative solution. Six of these customers were in the process of developing and testing FPGA hardware but ultimately decided not to purchase it before completing this process. The remaining 15 customers purchased FPGA technology, only to cancel it after using it. Because all of these customers continued to utilize the underlying data, these cancelations demonstrate that FPGA technology is an optional service, even for those customers that seek to reduce jitter.

Moreover, as noted above, no other exchange currently offers FPGA technology in conjunction with their proprietary data feeds as a separate service, notwithstanding the fact that it is a widely available technology, providing further evidence that customers have multiple

options at their disposal to address jitter.

The Exchange is aware of no systematic differences among market participants that choose to use or not to use FPGA technology. Jitter is a potential issue for any intensive user of market data, including banks, high-frequency trading firms, and hedge funds, yet not all of these customers purchase FPGA technology. The determining factor is not the type of customer, but rather the compatibility of FPGA technology with the customer's specific systems architecture and technical requirements, which can and do change over time as systems are modified, replaced or updated.

For all of these reasons, customers can discontinue the use of FPGA technology at any time, or decide not to purchase it, for any reason, including the level of fees.

Customers that choose not to purchase FPGA technology are not impacted by the proposal.

The proposed fees will be available to all customers on a non-discriminatory basis, and therefore are not designed to permit unfair discrimination between customers, issuers, brokers, or dealers.

B. Self-Regulatory Organization's Statement on Burden on Competition

The Exchange does not believe that the proposed rule change will impose any burden on competition not necessary or appropriate in furtherance of the purposes of the Act.

This Proposal, a response to customer demand, is a product of a competitive marketplace. To date, lower levels of peak activity at the BX Exchange relative to the Nasdaq exchange have been associated with low levels of customer interest in this product. Recently, however, BX has heard from customers interested in using FPGA technology for BX TotalView. To address this customer demand, and to drive liquidity to the BX Exchange by making it a more attractive trading venue, BX has decided to offer this product.

Approval of this Proposal will further promote competition by providing market participants additional choices in the transmission of depth of book data.

Nothing in the Proposal burdens inter-market competition (the competition among self-regulatory organizations) because approval of the Proposal does not impose any burden on the ability of other exchanges to compete. As noted above, FPGA technology is generally available and any exchange has the ability to offer it if it so chooses.

Nothing in the Proposal burdens intra-market competition (the competition among consumers of exchange data) because FPGA technology is available to any customer under the same fee schedule as any other customer, and any market participant that wishes to purchase FPGA technology can do so on a non-discriminatory basis.

C. Self-Regulatory Organization's Statement on Comments on the Proposed Rule Change Received from Members, Participants, or Others

No written comments were either solicited or received.

III. Date of Effectiveness of the Proposed Rule Change and Timing for Commission Action

The foregoing rule change has become effective pursuant to Section 19(b)(3)(A)(ii) of the Act.[22]

At any time within 60 days of the filing of the proposed rule change, the Commission summarily may temporarily suspend such rule change if it appears to the Commission that such action is: (i) necessary or appropriate in the public interest; (ii) for the protection of investors; or (iii) otherwise in furtherance of the purposes of the Act. If the Commission takes such action, the Commission shall institute proceedings to determine whether the proposed rule should be approved or disapproved.

[22] 15 U.S.C. 78s(b)(3)(A)(ii).

IV. Solicitation of Comments

Interested persons are invited to submit written data, views, and arguments concerning the foregoing, including whether the proposed rule change is consistent with the Act. Comments may be submitted by any of the following methods:

Electronic comments:

- Use the Commission's Internet comment form (http://www.sec.gov/rules/sro.shtml); or
- Send an e-mail to rule-comments@sec.gov. Please include File Number SR-BX-2023-014 on the subject line.

Paper comments:

- Send paper comments in triplicate to Secretary, Securities and Exchange Commission, 100 F Street, NE, Washington, DC 20549-1090.

All submissions should refer to File Number SR-BX-2023-014. This file number should be included on the subject line if e-mail is used. To help the Commission process and review your comments more efficiently, please use only one method. The Commission will post all comments on the Commission's Internet website (http://www.sec.gov/rules/sro.shtml). Copies of the submission, all subsequent amendments, all written statements with respect to the proposed rule change that are filed with the Commission, and all written communications relating to the proposed rule change between the Commission and any person, other than those that may be withheld from the public in accordance with the provisions of 5 U.S.C. 552, will be available for website viewing and printing in the Commission's Public Reference Room, 100 F Street, NE, Washington, DC 20549 on official business days between the hours of 10:00 a.m. and 3:00 p.m. Copies of the filing also will be available for inspection and copying at the principal office of the Exchange. Do not include personal identifiable information in

submissions; you should submit only information that you wish to make available publicly. We may redact in part or withhold entirely from publication submitted material that is obscene or subject to copyright protection. All submissions should refer to File Number SR-BX-2023-014, and should be submitted on or before [insert date 21 days from publication in the Federal Register].

For the Commission, by the Division of Trading and Markets, pursuant to delegated authority.[23]

Sherry R. Haywood,

Assistant Secretary

[23] 17 CFR 200.30-3(a)(12).