



Cboe C1 Options Exchange Connectivity Manual

Version 1.0.0

November 16, 2018

Contents

1	Introduction	3
1.1	Overview	3
1.2	Connectivity Matrix	4
1.3	Physical Interfaces	5
2	Types of Connectivity	6
2.1	IPSec VPN.....	6
2.2	Co-location Cross-connect	6
2.3	Extranet	6
2.4	Directly Connected via Private Line Ethernet	7
3	Ordering Cross Connects to Cboe	8
3.1	Submit Request via Customer Web Portal	8
3.2	Required Information.....	8
3.3	LOA-CFA.....	8
3.4	Data Center Provider Request	8
3.5	Latency Equalization.....	8
4	Telecommunications Providers.....	10
4.1	Extranet Providers.....	10
4.1.1	Cboe Approved Extranet Providers	11
4.1.2	Carriers	12
5	Support.....	14
5.1	Support Hours	14

1 Introduction

1.1 Overview

The Cboe Options Exchange (“C1”) trading platform is housed in the Equinix data center in Secaucus, New Jersey. The secondary data center is located in 350 Cermak Chicago, IL (“ORD1”). Trading participants and market data subscribers are strongly encouraged to establish connectivity to both locations to minimize service disruption in the event of an issue at either data center. Secaucus is the “primary” or “hot” site, with Chicago being “secondary” or “warm”. A customer may receive market data from Chicago, and they may connect and heartbeat with order entry systems in Chicago. Orders submitted to Chicago will be rejected until Cboe declares the primary site in Secaucus “down.”

Cboe also provides a primary network Point of Presence (“PoP”) in the Cyxtera EWR2 data center in Weehawken, NJ. Customer’s can leverage their EWR2 connectivity to access multicast market data feeds and order entry sessions in the Cboe primary data center.

It is the customer’s responsibility for selecting their telecommunications provider and arranging for connections to Cboe data centers and PoPs.

Cboe supports the following network connectivity choices:

- **IPSec VPN** via the Internet (only for certification or test sessions);
- **Co-location Cross-connect** (i.e. for customers co-located in the same data center as the C1 trading platform or a PoP);
- **Extranet** connectivity (See the [Cboe Approved Extranet Provider](#) section for a list of approved Extranet Providers); and
- **Private line Ethernet** (circuit extension from a carrier to Cboe, see the [Carriers](#) section for a list of Carriers)

1.2 Connectivity Matrix

	NY4/NY5 Latency Equalized	EWR2	ORD1
Data Center Role	Primary		Secondary
Data Center Provider	Equinix	Cyxtera	Cyxtera
Site Location	Secaucus, NJ	Weehawken, NJ	Chicago, IL
Site Status	Hot/Primary	PoP for Primary	Warm/Secondary
Accepts Co-location Cross connects?	Yes	Yes	Yes
Accepts Circuit Extension from Telco?	Yes	Yes	Yes
Access to Production Sessions/feeds?	Yes	Yes	No
Access to Disaster Recovery Sessions/feeds?	No	No	Yes
Colocation of Network Equipment?	No	No	No
Redundant Connectivity Required?	No	No	No
1G Monthly Recurring Connectivity Fees	New physical ports that strictly connect to the new C1 environments will not be billable until after C1 production migration to Bats technology is complete. Post-integration pricing for physical port fees has not been determined, but C1 will provide ample notice to customers regarding any changes to existing connectivity fees which will be reflected in the C1 Fee Schedule and applicable to the new trading platform upon migration. See C1 Fee Schedule for details regarding connectivity fees for current C1 environment.		
10G Monthly Recurring Connectivity Fees			
Supported Media Types	SMF	SMF, MMF, Copper	SMF, MMF
Round Trip Time to Production FIX gateways	~11µs	~<100µs	N/A
Connectivity Contact	Greg Nelson (312) 994-3906	Bob Luparello (914) 309-2646	Bob Luparello (914) 309-2646

1.3 Physical Interfaces

The following standard physical interface specifications are supported in the EWR2, ORD1, and 400SL data center and PoPs. For other interface specifications contact noc@cboe.com.

10G	SR (multi-mode) , LR (single-mode) & ER (single-mode)
1G	SX (multi-mode), LX (single-mode) & 1000BaseT

The following standard physical interface specifications are supported in the NY4 and NY5 data center:

10G	LR (single-mode)
1G	LX (single-mode)

2 Types of Connectivity

2.1 IPsec VPN

- Customers may connect via an IPsec Virtual Private Network (“VPN”) over the Internet for access to order entry and unicast market data feeds for certification and test purposes only. LAN-to-LAN IPsec VPN supported.
- IP address of the host presented to Cboe must be registered.
- Customers must contact Cboe NOC for encryption details and to receive their pre-shared key.

Note: Cboe does not offer multicast market data feeds over VPN.

2.2 Co-location Cross-connect

Customers may co-locate within the NY5 data center or a data center where a Cboe PoP is located and cross-connect to Cboe.

- Each physical port connection (1Gbps and 10Gbps) within the Secaucus, Weehawken, and Chicago data centers/PoPs will be subject to a monthly recurring charge. New physical ports that strictly connect to the new C1 environments will not be billable until after C1 production migration to Bats technology is complete. Post-integration pricing for physical port fees has not been determined, but C1 will provide ample notice to customers regarding any changes to existing connectivity fees which will be reflected in the [C1 Fee Schedule](#) and applicable to the new trading platform upon migration. See the C1 Fee Schedule for more information regarding connectivity fees for current C1 environment.
- Co-location cross connect requests must come from a demarcation point on the data center floor or Mezzanine level. Roof-top access requests will not be accepted.
- Cboe reserves the right to charge for one-time setup and monthly recurring fees incurred connecting TPHs or extranets. See the [C1 Fee Schedule](#) for more information regarding any setup or recurring fees that are currently applicable.

With data center co-location, customers can place equipment, terminate communications circuits, and establish a cross-connect to Cboe (or other destinations) in their space. This gives the maximum amount of control to the customer. This option is neutral for the customer and provides the greatest flexibility for the customer in determining when and to whom to connect. Customers interested in co-location services should contact the data center/PoP Point of Contact (refer to the [Connectivity Matrix](#) section for POC information).

2.3 Extranet

Customers may provision connectivity to Cboe via an extranet.

Cboe C1 Options Exchange
Connectivity Manual (Version 1.0.0)

- Extranets have provisioned redundant connections to Cboe for use by multiple customers.
- Contact information for a variety of extranet providers is found below within the [Cboe Approved Extranet Providers](#) section below.

This method is an attractive alternative when:

- The customer would otherwise have to provision a long-haul private line;
- Outsourcing of network services and network management is an option; or
- The ease and speed of turn-up are important (when both the customer and Cboe have an existing connection to the extranet).

2.4 Directly Connected via Private Line Ethernet

Customers may connect to Cboe via Private Line Ethernet.

- No co-location space is required. Cross-connect from Telco demarcation point to Cboe network via an Ethernet interface.
- Each physical port connections (1Gbps and 10Gbps) within the Secaucus, Weehawken, and Chicago data centers/PoPs will be subject to a monthly recurring charge. New physical ports that strictly connect to the new C1 environments will not be billable until after C1 production migration to Bats technology is complete. Post-integration pricing for physical port fees has not been determined, but C1 will provide ample notice to customers regarding any changes to existing connectivity fees which will be reflected in the [C1 Fee Schedule](#) and applicable to the new trading platform upon migration.
- Cboe reserves the right to charge for one-time setup and monthly recurring fees incurred connecting TPHs or extranets. See the [C1 Fee Schedule](#) for more information regarding any setup or recurring fees that are currently applicable.
- Contact your carrier of choice to arrange connectivity to Cboe, see the [Carriers](#) section below.

3 Ordering Cross Connects to Cboe

3.1 Submit Request via Customer Web Portal

A Customer Web Portal account is required to request new cross connects to Cboe. Please see your firm's account administrator or contact the Trade Desk for an account:

- Trade Desk – (913) 815-7001
- Email – tradedesk@cboe.com

3.2 Required Information

- Location (NY5, NY4, EWR2, or 400SL)
- Number and speed of connections requested (1G or 10G)
- Registered BGP ASN (Cboe NOC can assign a private ASN)
- Networks advertised to Cboe (registered public IP's or Cboe assigned private addresses are accepted)
- Network and billing contact information
- Transit IP address (Public or private range assigned by Cboe NOC)

3.3 LOA-CFA

Upon approval of cross connect request, Cboe NOC will provide a Letter of Authorization - Customer Facility Assignment with the “Z-side” cage, cabinet, panel, and port pair assignment. The customer requesting the cross connect is known as the “A-Side.”

3.4 Data Center Provider Request

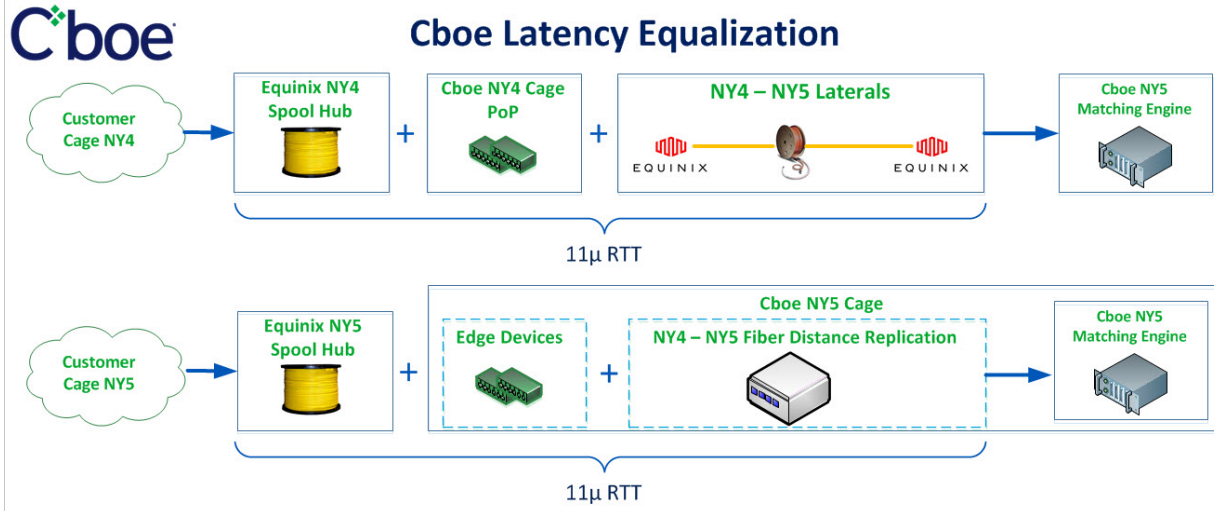
The requesting customer submits a cross connect request with the appropriate data center provider:

- Equinix – NY5 and NY4
- Cxtera – EWR2 and ORD1
- Cboe – 400SL

The data center provider will need the LOA-CFA and the “A-side” details to complete the connection. The “A-Side” customer is responsible for any data center setup fees and monthly recurring costs associated with the cross connect. As the “A-Side” customer, the customer is also responsible for initiating troubleshooting requests with the data center provider in the event of a down cross connect.

3.5 Latency Equalization

Cross connects originating within either NY4 or NY5 data centers will be engineered to provide equivalent latency between customer demarcation points and the Cboe order entry gateways in NY5. Equal fiber pathway latency will be determined by OBR testing. WAN circuits originating outside Secaucus, NJ will also be subject to latency equalization.



See [Cboe Latency Equalization](#) for further details.

4 Telecommunications Providers

Some telecommunications providers available within the Secaucus, Weehawken and Chicago data centers/PoPs are listed below. This list is a summary and is not indicative of Cboe preference or recommendation. For telecommunications providers not included on the list, please contact the Cboe NOC to discuss.

4.1 Extranet Providers

Cboe has arrangements with several extranet providers to aggregate customer connectivity and provide low cost, value-added B2B services such as multicast market data feeds. Extranet providers are required to sign Telecommunications Service Provider Agreement after meeting the requirements outlined in the Extranet Provider Manual.

4.1.1 Cboe Approved Extranet Providers

Company	Contact	Phone
BT Radianz www.btradianz.com	Gregory Knopp Gregory.Knopp@bt.com	(212) 205-1849
CenturyLink http://www.centurylink.com/technology	Danielle Durkin gems@centurylink.com	(973) 650-1107
Interactive Data www.interactivedata.com	Sales info@interactivedata.com	(212) 771-6565
IPC Systems, Inc. www.ipc.com	John Tarantino john.tarantino@ipc.com	(212) 709-1099
NetXpress www.netxpressllc.com	Craig Spital sales@netxpressllc.com	(312) 871-3190
NYSE Technologies (SFTI) www.nyse.com/technologies	NYSE Technologies Sales Sfti-Info@theice.com	(212) 656-3400
TMX Atrium Networks www.tmxatrium.com	Jim Gregory jim.gregory@tmxatrium.com	(917) 848-3718
TNSi www.tnsi.com	John Owens jowens@tnsi.com	+44 2073 361 526

Cboe C1 Options Exchange
Connectivity Manual (Version 1.0.0)

4.1.2 Carriers

Telecom carriers provide a dedicated circuit between customers in different data centers to a demarcation point in the Secaucus, Weehawken or Chicago data centers/PoPs. The circuit is extended from the demarc to a Cboe network device.

It is recommended that customers use redundant connectivity via multiple telecommunications providers to each of the Cboe data centers.

Contact Cboe NOC for information about circuit ordering details (e.g. NPA-NXX, LOA/CFA requirements, demarcation information, etc.).

Company	Contact	Phone	Data Center
Anova Technologies www.anova-tech.com	Heather Cannon hcannon@anova-tech.com	(312) 540-9594 x1113	Weehawken Chicago
A T & T www.business.att.com	Dale Rife wr7024@att.com	(816) 275-2335	Weehawken
Hibernia Atlantic www.hiberniaatlantic.com	Hibernia Sales sales@hibernianetworks.com	(908) 516-4200 (888) 774-8080	Weehawken Chicago
Hudson Fiber www.hudsonfiber.com	Thomas Kennedy tkennedy@hudsonfiber.com	(201) 820-8206	Weehawken
Level(3) Communications www.level3.com	William Simmons william.simmons@level3.com	(913) 909-9009	Weehawken Chicago
Lightower Fiber Networks www.lightower.com	Christopher J. Schook cschook@lightower.com Jeffrey Mollica jmollica@lightower.com	(631) 974-4307 (516) 375-6808	Weehawken Secaucus
NexGen Networks www.nexgen-net.com	Jeffrey Barth jeffrey.barth@nexgen-net.com	(800) 310-2501	Weehawken Chicago
Optimum LightPath www.optimumlightpath.com	Colleen M. Capen ccapen@optimumlightpath.com	(201) 644-9610	Weehawken
Perseus www.perseus.co	Tony Gerace agerace@perseus.co	(347) 325-9416	Secaucus Weehawken Chicago
Sidera Networks www.sidera.net	Stephen Papa stephen.papa@sidera.net	(212) 324-5033	Weehawken Chicago
Spread Networks, LLC www.spreadnetworks.com	Spread Network Sales sales@spreadnetworks.com	(646) 837-0330	Weehawken Chicago

Cboe C1 Options Exchange
Connectivity Manual (Version 1.0.0)

Company	Contact	Phone	Data Center
Verizon Financial Network www.verizonbusiness.com/solutions/finance/institutional/servicesnetwork.xml	Verizon Financial Network Sales vfnsales@verizon.com	(800) 825- 9196	Weehawken Chicago
XO Communications www.xo.com	Robert Bye robert.g.bye@xo.com	(630) 544-8512	Weehawken Chicago
Zayo Fiber Solutions/AboveNet www.abovenet.com	Travis Brown tbrown@above.net	(212) 803-5597	Weehawken Chicago

5 Support

Please e-mail questions or comments regarding this manual to noc@cboe.com. Cboe NOC is a one-call shop that supports customer and telecommunications providers during initial setup and continuing support of all connectivity issues.

5.1 Support Hours

- Phone – **(913) 815-7005**
- Email – noc@cboe.com
- Core phone support hours are 7:00 AM – 10:00 PM ET Monday – Friday.
- Outside of core support hours, to report a network issue that must be addressed prior to market open – leave a voice mail with the firm name, contact number, and the nature of the issue.
- For non-critical issues or for information, please email or NOC and your request will be responded to on the next business day.

Revision History

Document Version	Date	Description
1.0.0	11/16/18	Initial version of Manual supporting Cboe Options Exchange migration to Bats Technology.