Securities Industry Automation Corporation
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June 5, 2023

To: OPRA Multicast Subscribers

Subject: New Network Addresses and Expansion of OPRA Data Dissemination from a 48-Line to a 96-Line Multicast Network: **Industry Test #3 - Saturday, June 10, 2023 - Reminder**

What's New:

As previously announced, for optimal symbol balancing and line capacity utilization, OPRA will be expanding data dissemination from a 48-line to a 96-line multicast data distribution network. Bandwidth requirements are provided below.

Changes Being Made:

As part of expanding data dissemination from a 48-line to a 96-line multicast data distribution network, and to help facilitate capacity upgrades to the ICE Global Network (IGN), new subnets, rendezvous points, source addresses, and multicast addresses are being introduced (including Global Trading Hours (GTH)). Note that these changes apply to customer connections via both IGN and the NMS Network in Mahwah.

The changes are being made in two phases:

- **Phase 1**: migration of the current 48-line symbol distribution schema to new network subnets, rendezvous points, source addresses, and multicast addresses
- **Phase 2**: migration of the new symbol distribution schema over 96 lines

When it is Changing:

Activation of the new network subnets, rendezvous points, source addresses, and multicast addresses is scheduled take place at start of day on **Monday, July 10, 2023**.

Activation of data dissemination on the 96-line multicast data distribution network is scheduled to take place at start of day, **Monday, July 31, 2023.** Symbol routing examples have been provided in the 96-line multicast data distribution.

For detailed schedule information including all industry tests, please consult the OPRA 96-Line Migration FAQ's located in the Specification section of the Document Library on the OPRA website, here.

Testing Opportunities:

- **Cert System Functional Testing:** New symbol routing test schema
  - Began: Monday, April 3, 2023
  - Ends: Friday, July 28, 2023

- **Industry Test #3: Saturday June 10, 2023,7:00AM-3:30PM, ET**

  - **OPRA GTH**
  - **Session 1: (7:00-8:00AM):** test data over new network addresses at primary data center and failover to secondary data center over new network addresses
  - **OPRA GTH Restart (8:00-9:00AM)**
  - **Session 2: (9:00-10:00AM):** test data over new network addresses at primary data center and failover to secondary data center over existing network addresses

  - **OPRA**
  - **Session 1: (9:00-10:30AM)**: 48-lines with existing symbol distribution schema at primary data center and failover to secondary data center over new network addresses
  - **OPRA Restart (10:30-11:30AM)**
  - **Session 2 (11:30AM-12:30PM)**:48-lines with existing symbol distribution schema at the primary data center and failover to the secondary data center over existing network addresses
  - **OPRA Restart (12:30-1:30PM)**
  - **Session 3 (1:30PM-2:00PM):** OPRA 96-lines with new distribution schema over new network addresses
  - **OPRA Restart (2:00PM-2:30PM)**
  - **Session 4 (2:30PM-3:30PM):** OPRA 96-lines capacity test data over new multicast addresses.
  - **The test plan can be located on pages 3 thru 7**

New OPRA subnets, rendezvous points, source addresses, and multicast addresses can be found in the appendices of the Common IP Multicast Distribution specification here.

Data Subscribers who receive OPRA from connectivity service providers other than ICE Global Network (IGN) or the NMS Network must contact their connectivity service providers to coordinate testing.

Test Registration

Each OPRA Data Subscriber participating in the test should register at CTA-OPRA-Support@siac.com .

Technical Inquiries

- NMS Product Management Support Email: CTA-OPRA-Support@siac.com
- NMS Production Management Support Line: 212-656-8177, Option 2 (Monday through Friday, 9:00 AM-5:00 PM ET)

OPRA GTH 7:00am to 8:00am ET Session #1 of 2

OPRA GTH Migration to new network subnets, rendezvous points, source addresses, and multicast addresses
Test Date & Time: June 10, 2023, 7:30 AM to 10:00 AM ET (Approximate)

Hourly Test Script					
#	**Time**	**Test Category**	**Action By**	**Test Description**	**Expected Results**
Both Primary Data Center and Disaster Recovery Data Center on NEW Output Multicast Network					
Friday, June 9					
1	8:30:00 PM - 9:30:00 PM	SOD	OPRA	OPRA Global Trading Hours (GTH) Production and DR sites on the New Output Multicast addresses for both Realtime and Retransmission lines (refer to Common IP Multicast Distribution Network Specification for network addresses).	
				OPRA GTH to trigger Start of Day message on the new Output Multicast lines	Start-of-Day messages published over the new Output Multicast lines followed by the multicast Line Integrity messages every 10 seconds until the participants begin to generate data
Saturday, June 10					
2	7:00:00 AM	Participant Connectivity/Input	CBOE	CBOE to establish connectivity for OPRA GTH Input lines	CBOE establish connections
				CBOE to start submitting Quote and Trade data	Quotes and trades accepted and disseminated via the new multicast output lines
3	7:30:00 AM - 8:00:00 AM	Site failover from Primary Data Center to Disaster Recovery Data Center *(Both Production and DR sites on the new Output Multicast lines)*	OPRA	OPRA GTH to simulate Production site failure	-- Disconnection of all Input and Retransmission lines to OPRA GTH -- Disruption in output multicast data dissemination for all lines
				OPRA GTH to failover to DR site and publish following messages via the new Output Multicast lines on DR site: 1) Reset Block Sequence Number (Category H Type K) for each OPRA output line to reset the sequence number to 1 2) Disaster Recovery Data Center Activation (Category H Type P) message 3) Zero Quotes (Quote messages with Zero Price and Size) on behalf of CBOE across all symbols	Subscribers to receive and process following messages disseminated over the new multicast output lines on the DR site -- Sequence Reset Message (Category H / Type K) -- Disaster Recovery Site Activation Control Message (Category H, Type P) -- Zero quotes Note: To request retransmission for any range of messages disseminated after the sequence reset to 1, Data Subscriber would be required to apply the offset up to 4,294,967,295 in the message sequence number
				OPRA GTH to enable input lines and Retransmission lines of the DR site	DR Input IP/Ports available to establish connections
			CBOE	CBOE to reconnect to input IP/ports on OPRA GTH DR site and establish sequence numbers by sending Block Sequence Number Status Inquiry Request (Category N / Type L) and Message Count Status Inquiry Request (Category N / Type R).	OPRA GTH to accept input connections and respond with Block Sequence Response (Category N / Type M) and Message Count Status Response (Category N / Type S)
				CBOE to start submitting Options data from the latest Sequence Numbers	-- Subscribers to accept Quotes and trades disseminated on the new multicast output lines. -- Subscribers can request Retransmission for any gaps via the retransmission lines on the DR site. Retransmitted data disseminated via the new multicast output lines
4	8:00:00 AM			End of Session (Note - An End-of-Day message will not be triggered by OPRA, but system will be rebooted for next test)	

OPRA GTH 9:00am to 10:00am ET Session #2 of 2

SYSTEM RESTART - OPRA to run End of Day, reboot and run Start of Day to bring up system in a clean state					
FALLBACK TEST: Primary Data Center on NEW Output Multicast Network while Disaster Recovery Data Center on OLD (existing) Output Multicast Network					
5	9:00:00 AM	SOD	OPRA	OPRA GTH Production site on the New Output Multicast addresses for Realtime and Retransmission lines. DR site on Old (current) Output Multicast addresses.	
				OPRA GTH to trigger Start-of-Day message on the new Output Multicast lines	
6	9:00:00 AM -9:30:00 AM	Participant Connectivity/Input	CBOE	Participants to establish connectivity for OPRA GTH Input lines	Participants establish connections
				Participants to start submitting Quote and Trade data	Quotes and trades accepted and disseminated via the new multicast output lines
7	09:30:00 AM - 10:00 AM	Site failover from Primary Data Center to Disaster Recovery Data Center *(Production site on the new output multicast lines while DR site of old output multicast lines. This will be the configuration for the first week of cut-over)*	OPRA	OPRA GTH to simulate Production site failure	-- Disconnection of all OPRA GTH Input and Retransmission lines for all Participants and Data Subscribers -- Disruption in Output Multicast data dissemination for all lines
				OPRA GTH to failover to DR site and publish following messages via the old (current) output mulicast lines on DR site: 1) Reset Block Sequence Number (Category H Type K) for each OPRA output line to reset the sequence number to 1 2) Disaster Recovery Data Center Activation (Category H Type P) message 3) Zero Quotes (Quote messages with Zero Price and Size) on behalf of all participants across all symbols	Subscribers to receive and process following messages disseminated over the old (current) multicast output lines on the DR site+A2 -- Sequence Reset Message (Category H / Type K) -- Disaster Recovery Site Activation Control Message (Category H, Type P) -- Zero quotes Note: To request retransmission for any range of messages disseminated after the sequence reset to 1, Data Subscriber would be required to apply the offset up to 4,294,967,295 in the message sequence number
				OPRA GTH to enable input lines and Retransmission lines of the DR site	DR Input IP/Ports available to establish connections
			CBOE	Participants to reconnect to input IP/ports on OPRA GTH DR site and establish sequence numbers by sending Block Sequence Number Status Inquiry Request (Category N / Type L) and Message Count Status Inquiry Request (Category N / Type R).	OPRA GTH to accept input connections and respond with Block Sequence Response (Category N / Type M) and Message Count Status Response (Category N / Type S)
				Participants to start submitting Options data from the latest Sequence Numbers	-- Subscribers to accept Quotes and trades disseminated on the old (current) multicast output lines. -- Subscribers can request Retransmission for any gaps via the retransmission lines on the DR site. Retransmitted data disseminated via the old (current) multicast output lines
8	10:00:00 AM			End of test	

OPRA 9:30am to 10:30am ET Session #1 of 4

OPRA Migration to new network subnets, rendezvous points, source addresses, and multicast addresses
Test Date & Time: June 10, 2023, 9:00 AM to 3:30 PM ET (Approximate)

Hourly Test Script

#	Time	Test Category	Action By	Test Description	Expected Results
Both Primary Data Center and Disaster Recovery Data Center on NEW Output Multicast Network					
1	1:30:00 AM	SOD	OPRA	OPRA Production and DR sites on the New Output Multicast addresses for both Realtime and Retransmission lines (refer to Common IP Multicast Distribution Network Specification for network addresses). Both sites on the existing 48-line Traffic Distribution.	
				OPRA to trigger Start-of-Day message on the new Output Multicast lines	Start-of-Day messages published over the new Output Multicast lines followed by the multicast Line Integrity messages every 10 seconds until the participants begin to generate data
2	1:30:00 -9:30:00 AM	Participant Connectivity/Input	Participants	Participants to establish connectivity for OPRA Input lines	Participants establish connections
				Participants to start submitting Quote and Trade data	Quotes and trades accepted and disseminated over the new 48 Output Multicast lines (via the existing 48-line Traffic Distribution). Remaining 48 Lines to publish Line Integrity messages over the New 48 Output Multicast lines
3	9:30:00 AM	Market Open	OPRA	Market Open	
4	10:00 - 10:30 AM	Site failover from Primary Data Center to Disaster Recovery Data Center *(Both Production and DR sites on the new Output Multicast lines)*	OPRA	OPRA to simulate Production site failure	-- Disconnection of all OPRA Input and Retransmission lines for all Participants and Data Subscribers -- Disruption in Output Multicast data dissemination for all lines
				OPRA to failover to DR site and publish following messages via the new Output Multicast lines on DR site: 1) Reset Block Sequence Number (Category H Type K) for each OPRA output line to reset the sequence number to 1 2) Disaster Recovery Data Center Activation (Category H Type P) message 3) Zero Quotes (Quote messages with Zero Price and Size) on behalf of all participants across all symbols	Subscribers to receive and process following messages disseminated over the new multicast output lines on the DR site -- Sequence Reset Message (Category H / Type K) -- Disaster Recovery Site Activation Control Message (Category H, Type P) -- Zero quotes Note: To request retransmission for any range of messages disseminated after the sequence reset to 1, Data Subscriber would be required to apply the offset up to 4,294,967,295 in the message sequence number
				OPRA to enable input lines and Retransmission lines of the DR site	DR Input IP/Ports available to establish connections
			Participants	Participants to reconnect to input IP/ports on OPRA DR site and establish sequence numbers by sending Block Sequence Number Status Inquiry Request (Category N / Type L) and Message Count Status Inquiry Request (Category N / Type R).	OPRA to accept input connections and respond with Block Sequence Response (Category N / Type M) and Message Count Status Response (Category N / Type S)
				Participants to start submitting Options data from the latest Sequence Numbers	-- Subscribers to accept Quotes and trades disseminated on the new multicast output lines. -- Subscribers can request Retransmission for any gaps via the retransmission lines on the DR site. Retransmitted data disseminated via the new multicast output lines
5	10:30:00 AM			End of Session (Note - An End-of-Day message will not be triggered by OPRA, but system will be rebooted for next test)	

OPRA 11:30am to 12:30pm ET Session #2 of 4

SYSTEM RESTART - OPRA to run End of Day, reboot and run Start of Day to bring up system in a clean state					
FALLBACK TEST: Primary Data Center on NEW Output Multicast Network while Disaster Recovery Data Center on OLD (existing) Output Multicast Network					
6	11:30:00 AM	SOD	OPRA	OPRA Production site on the New Output Multicast addresses for Realtime and Retransmission lines. DR site on Old (current) Output Multicast addresses. Both sites on the existing 48-line Traffic Distribution.	
				OPRA to trigger Start-of-Day message on the new Output Multicast lines	
7	11:45:00 AM	Market Open	OPRA	Market Open	
8	11:45:00 AM - 12:00 PM	Participant Connectivity/Input	Participants	Participants to establish connectivity for OPRA Input lines	Participants establish connections
				Participants to start submitting Quote and Trade data	Quotes and trades accepted and disseminated via the new multicast output lines
9	12:00 - 12:30 PM	Site failover from Primary Data Center to Disaster Recovery Data Center *(Production site on the new output multicast lines while DR site of old output multicast lines. This will be the configuration for the first week of cut-over)*	OPRA	OPRA to simulate Production site failure	-- Disconnection of all OPRA Input and Retransmission lines for all Participants and Data Subscribers -- Disruption in Output Multicast data dissemination for all lines
				OPRA to failover to DR site and publish following messages via the old (current) output mulicast lines on DR site: 1) Reset Block Sequence Number (Category H Type K) for each OPRA output line to reset the sequence number to 1 2) Disaster Recovery Data Center Activation (Category H Type P) message 3) Zero Quotes (Quote messages with Zero Price and Size) on behalf of all participants across all symbols	Subscribers to receive and process following messages disseminated over the old (current) multicast output lines on the DR site -- Sequence Reset Message (Category H / Type K) -- Disaster Recovery Site Activation Control Message (Category H, Type P) -- Zero quotes Note: To request retransmission for any range of messages disseminated after the sequence reset to 1, Data Subscriber would be required to apply the offset up to 4,294,967,295 in the message sequence number
				OPRA to enable input lines and Retransmission lines of the DR site	DR Input IP/Ports available to establish connections
			Participants	Participants to reconnect to input IP/ports on OPRA DR site and establish sequence numbers by sending Block Sequence Number Status Inquiry Request (Category N / Type L) and Message Count Status Inquiry Request (Category N / Type R).	OPRA to accept input connections and respond with Block Sequence Response (Category N / Type M) and Message Count Status Response (Category N / Type S)
				Participants to start submitting Options data from the latest Sequence Numbers	-- Subscribers to accept Quotes and trades disseminated on the old (current) multicast output lines. -- Subscribers can request Retransmission for any gaps via the retransmission lines on the DR site. Retransmitted data disseminated via the old (current) multicast output lines
10	12:30:00 PM			End of Session (Note - An End-of-Day message will not be triggered by OPRA, but system will be rebooted for next test)	

OPRA 1:30pm to 2:00pm ET Session #3 of 4

SYSTEM RESTART - OPRA to run End of Day, reboot and run Start of Day to bring up system in a clean state					
96-Line Traffic Distribution Test over the NEW Output Multicast Network					
11	1:30:00 PM	SOD	OPRA	OPRA on the New Output Multicast addresses for Realtime and Retransmission lines on the new **96-line Traffic Distribution** (refer to www.opraplan.com/document-library for information regarding the Traffic Distribution)	
				OPRA to trigger Start-of-Day message on the new Output Multicast lines	
12	1:30:00 - 2:00:00 PM	Participant Connectivity/Input	Participants	Participants to establish connectivity for OPRA Input lines	Participants establish connections
				Participants to start submitting Quote and Trade data	Quotes and trades accepted and disseminated via the new multicast output lines across the 96-lines
13	2:00:00 PM			End of Session (Note - An End-of-Day message will not be triggered by OPRA, but system will be rebooted for next test)	

OPRA 2:30pm to 3:30pm ET Session #4 of 4

SYSTEM RESTART - OPRA to run End of Day, reboot and run Start of Day to bring up system in a clean state (*No Network change during this restart*)					
Capacity Test for the 96-Line Traffic Distribution over the NEW Output Multicast Network					
14	2:30:00 PM	SOD	OPRA	OPRA on the New Output Multicast addresses for Realtime and Retransmission lines on the new 96-line Traffic Distribution	
				OPRA to trigger Start-of-Day message on the new Output Multicast lines	
15	2:30:00 - 3:30:00 PM	Capacity Test	OPRA	OPRA to simulate data for Capacity Test - Initial Rate = 1M msg/100ms. Rate will be maintained for 2 minutes - Rate will increase by 1M msg/100ms every 2 minutes, with highest rate at 14M msg/100ms - Total duration = ~ 28 Minutes	
16	3:30:00 PM			End of Test	