May 16, 2023

To: OPRA Multicast Subscribers

Subject: Expansion of OPRA Data Dissemination from a 48-Line to a 96-Line Multicast Network: Industry Test #1 - Saturday, May 20, 2023 -- FINAL 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 will take place at start of day on **Monday, July 10, 2023**.

Activation of data dissemination on the 96-line multicast data distribution network will 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 [here](#).

Testing Opportunities:

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

• **Industry Test #1**: Saturday May 20, 2023, 9:00 AM - 12:00 PM, ET
  - **Phase I**: OPRA and GTH test data over new network addresses with existing 48-line symbol distribution schema at the primary data center
  - **Phase I**: Failover testing of new network addresses at the secondary data center
  - The test plan can be located on pages 3 and 4
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)
### Hourly Test Script

<table>
<thead>
<tr>
<th>Time</th>
<th>Test Category</th>
<th>Action By</th>
<th>Test Description</th>
<th>Expected Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00:00 AM</td>
<td>SOD</td>
<td>OPRA GTH</td>
<td>OPRA Global Trading Hours (GTH) Production and DR sites on the New Output Multicast addresses.</td>
<td>-- Disconnection of all Input and Retransmission lines to OPRA GTH</td>
</tr>
<tr>
<td>9:00:00 AM</td>
<td>Participant Connectivity/Input</td>
<td>CBOE</td>
<td>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 S).</td>
<td>-- Subscribers to accept Quotes and trades disseminated via the new multicast output lines.</td>
</tr>
<tr>
<td>9:00:00 AM</td>
<td>CBOE</td>
<td></td>
<td>CBOE to establish connectivity for OPRA GTH Input lines</td>
<td>-- Subscribers to accept Quotes and trades disseminated via the new multicast output lines.</td>
</tr>
<tr>
<td>9:00:00 AM</td>
<td>Participant Connectivity/Input</td>
<td>CBOE</td>
<td>CBOE to establish connectivity</td>
<td>-- Subscribers can 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.</td>
</tr>
<tr>
<td>9:00:00 AM</td>
<td>CBOE</td>
<td></td>
<td>CBOE to start submitting Options data from the latest Sequence Numbers</td>
<td>-- Subscribers to accept Quotes and trades disseminated via the old multicast output lines.</td>
</tr>
<tr>
<td>9:00:00 AM</td>
<td>SOD</td>
<td>OPRA</td>
<td>OPRA GTH to trigger Start of Day message on the new Output Multicast lines</td>
<td>-- Subscribers to accept Quotes and trades disseminated via the old (current) multicast output lines.</td>
</tr>
<tr>
<td>9:00:00 AM</td>
<td>Participant Connectivity/Input</td>
<td>CBOE</td>
<td>Participants to establish connectivity for OPRA GTH Input lines</td>
<td>-- Subscribers to accept Quotes and trades disseminated via the new multicast output lines.</td>
</tr>
<tr>
<td>9:00:00 AM</td>
<td>CBOE</td>
<td></td>
<td>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 S).</td>
<td>-- Subscribers to accept Quotes and trades disseminated via the new multicast output lines.</td>
</tr>
<tr>
<td>9:00:00 AM</td>
<td>CBOE</td>
<td></td>
<td>Participants to start submitting Options data from the latest Sequence Numbers</td>
<td>-- Subscribers to accept Quotes and trades disseminated via the old (current) multicast output lines.</td>
</tr>
<tr>
<td>10:00:00 AM</td>
<td></td>
<td></td>
<td>End of test</td>
<td></td>
</tr>
</tbody>
</table>

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### Fallback Test: Primary Data Center on New Output Multicast Network while Disaster Recovery Data Center on Old (Existing) Output Multicast Network

- **Participate in the system.**
- **Start of Day message on the new Output Multicast lines.**
- **Subscribers to receive and process following messages disseminated over the old multicast output lines.**
### OPRA Migration to new network subnets, rendezvous points, source addresses, and multicast addresses

**Test Date & Time:** May 20, 2023, 9:00 AM to 12:30 PM ET (Approximate)

#### Hourly Test Script

<table>
<thead>
<tr>
<th>#</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Both Primary Data Center and Disaster Recovery Data Center on NEW Output Multicast Network</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>10:30:00 AM</td>
<td>OPRA</td>
<td>OPRA</td>
<td>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.</td>
<td>Participants establish connectivity for OPRA Input lines</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>OPRA to trigger Start-of-Day message on the new Output Multicast lines.</td>
</tr>
<tr>
<td>2</td>
<td>1:30:00 AM - 9:30:00 AM</td>
<td>Participant Connectivity/Input</td>
<td>Participants</td>
<td>Participants establish connectivity for OPRA Input lines</td>
<td>Participants establish connections</td>
</tr>
<tr>
<td></td>
<td>9:30:00 AM</td>
<td>OPRA</td>
<td>OPRA</td>
<td>OPRA to simulate Production site failure</td>
<td>Participants establish connections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Market Open</td>
<td>OPRA</td>
<td>Site failover from Primary Data Center to Disaster Recovery Data Center. (Both Production and DR sites on the new Output Multicast lines)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2:00:00 AM</td>
<td>OPRA</td>
<td>Participants</td>
<td>OPRA to enable input lines and Retransmission lines of the DR site</td>
<td>Participants to start submitting Options data from the latest Sequence Numbers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>OPRA to accept input connections and respond with Block Sequence Response (Category N / Type M) and Message Count Status Response (Category N / Type S)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Subscribers to accept Quotes and trades disseminated on the new multicast output lines.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Subscribers can request Retransmission for any gaps via the retransmission lines on the DR site.</td>
</tr>
<tr>
<td></td>
<td>10:30:00 AM</td>
<td>OPRA</td>
<td>OPRA</td>
<td>OPRA to simulate Production site failure</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Market Open</td>
<td>OPRA</td>
<td>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)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>11:30:00 AM</td>
<td>OPRA</td>
<td>OPRA</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Market Open</td>
<td>OPRA</td>
<td>OPRA to simulate Production site failure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11:45:00 AM</td>
<td>OPRA</td>
<td>OPRA</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>12:00:00 PM</td>
<td>OPRA</td>
<td>OPRA</td>
<td>OPRA to simulate Production site failure</td>
<td></td>
</tr>
</tbody>
</table>

#### SYSTEM RESTORE: OPRA Systems End of Day, report 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

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<tr>
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</thead>
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<tr>
<td>6</td>
<td>11:30:00 AM</td>
<td>SOD</td>
<td>OPRA</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Market Open</td>
<td>OPRA</td>
<td>OPRA to simulate Production site failure</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>11:45:00 AM</td>
<td>OPRA</td>
<td>OPRA</td>
<td>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)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>12:00:00 PM</td>
<td>Participant Connectivity/Input</td>
<td>Participants</td>
<td>Participants establish connectivity for OPRA Input lines</td>
<td>Participants establish connections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OPRA</td>
<td>OPRA</td>
<td>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.</td>
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</tr>
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<td></td>
<td></td>
<td>Market Open</td>
<td>OPRA</td>
<td>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)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>1:00:00 AM</td>
<td>OPRA</td>
<td>OPRA</td>
<td>OPRA to enable input lines and Retransmission lines of the DR site</td>
<td>Participants to start submitting Options data from the latest Sequence Numbers</td>
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<td></td>
</tr>
<tr>
<td>10</td>
<td>2:00:00 AM</td>
<td>OPRA</td>
<td>OPRA</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Market Open</td>
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<td>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)</td>
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