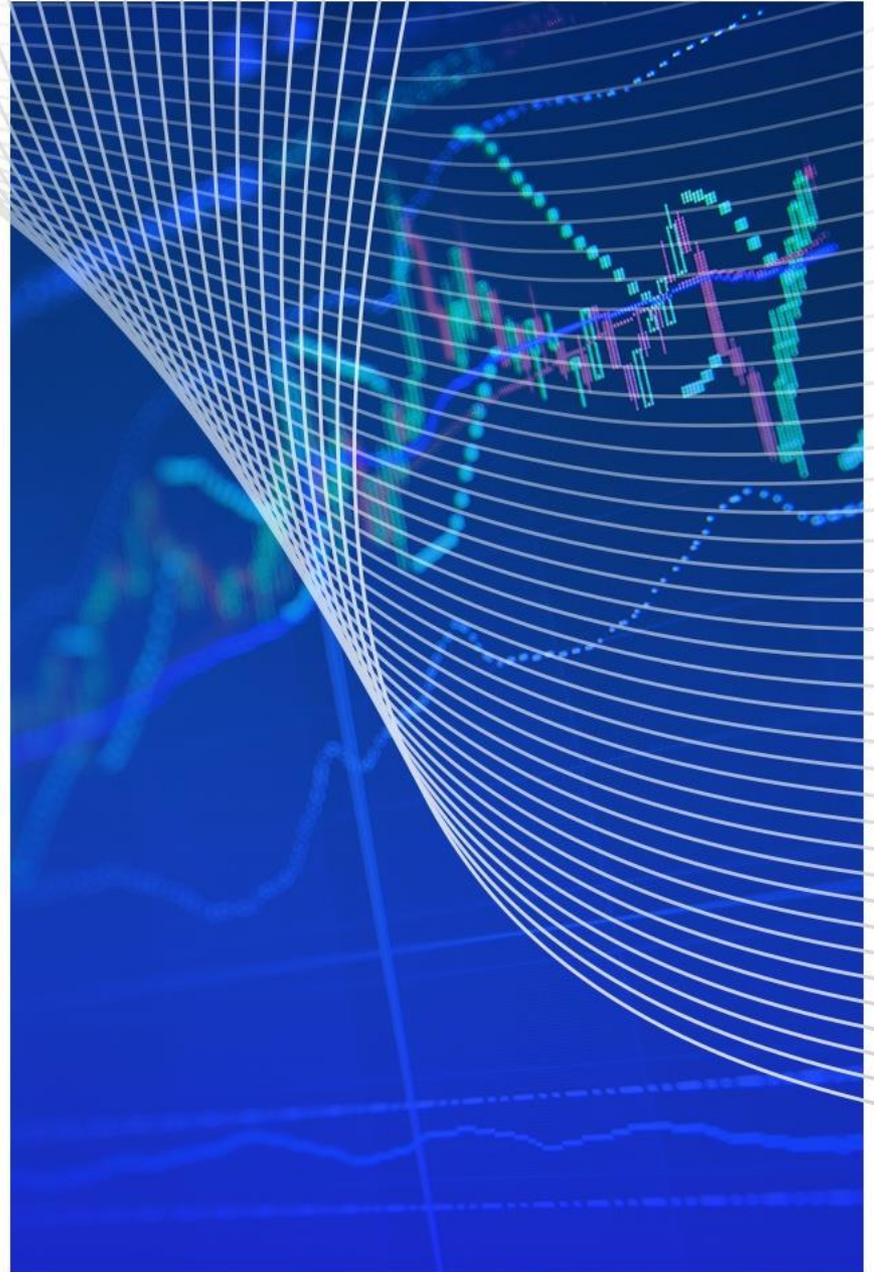


PILLAR SIP MIGRATION TEST PLAN

April 08, 2020



KEY TIMELINE

Certification (Cert) System Functional Testing

- From: Tuesday, February 18, 2020
- Through: Friday, June 26, 2020

Industry Functional Testing

- Saturday, April 18, 2020
- Saturday, May 2, 2020
- Saturday, May 16, 2020

Industry Non-Functional Testing

- Saturday, May 30, 2020
- Saturday, June 6, 2020
- Saturday, June 20, 2020

Parallel Production Testing

- From: Monday, May 18, 2020
- Through: Friday, July 10, 2020

Production Final Software Test

- Saturday, June 27, 2020

Production Confidence Test

- Saturday, July 11, 2020

Activation Date

- Monday, July 13, 2020

TESTING PLAN

- Certification Testing is available everyday during production hours
- All input participants must certify in Cert before getting access to Production IP/Ports
 - Both Input and Retransmission lines Request forms need to be submitted by each participant
 - Contact information and Respective forms can be found at <https://www.ctaplan.com/pillar>
- Participants can verify connectivity to Pillar SIP Production lines starting April 9, prior to first weekend test.
- Conference Call will be scheduled on each weekend test and Test Scripts will be provided to the participants

WEEKEND PRODUCTION TESTS

WEEKEND TEST SCHEDULE

April 18, 2020 - Functional Test

- Test Plan
 - Participants will run through the tests scripts, as applicable
 - Participants may run any additional functional test as needed for their system functionality
 - Participants will confirm test results by returning the completed test scripts
- Participants will also connect to their legacy NMS SIP lines and simultaneously send data to both systems

WEEKEND TEST SCHEDULE

May 2, 2020 - Functional Test

- Participants may repeat functional tests from April 18
- Market-Wide-Circuit-Breaker Test
 - Pillar SIP will disseminate the Market-Wide Circuit Breaker Decline Level Status (Category M Type K) message containing the calculated Level 1, Level 2 & Level 3 decline level values
 - Pillar SIP will disseminate separate Market-Wide Circuit Breaker Status Level 1 and Level 2 threshold breaches over the CTS and CQS multicast feeds
 - Listing Exchanges, upon receiving Level 1 and Level 2 threshold breach messages in turn should halt all respective Exchange's listed securities and not re-open for fifteen (15) minutes
 - After the 15 minutes have expired for each Level threshold breach, Listing Exchanges should resume all securities.
 - All exchanges should resume inputting trades and quotes
- Participants will also connect to their legacy NMS SIP lines and simultaneously send data to both systems

WEEKEND TEST SCHEDULE

May 16, 2020 - Functional Test

- Participants may repeat functional tests from April 18 and May 2
- Participants will also connect to their legacy NMS SIP lines and simultaneously send data to both systems
- Participants will leave their parallel connectivity to Pillar SIP in-place for Monday, May 18, 2020

Key Milestone - Parallel Production Phase

- Parallel Production Testing will commence from Monday, May 18, 2020
- Participants will begin to send quote and trade data to both Legacy and Pillar SIP simultaneously
- Pillar SIP will consume input data for data comparison:
 - Parallel Production Multicast Lines will be as follows:
 - CQS Tape A Multicast Line 1 and CQS Tape B Multicast Line 1
 - CTS Tape A Multicast Line 1, CTS Tape B Multicast Line 1, and CTS Tape B Index Line 1
- Legacy NMS SIP remains live, and will continue to publish Quote and Trade Data for all symbols, until Pillar SIP activation

WEEKEND TEST SCHEDULE

May 30, 2020 - Non-Functional Test

- Input Failure Recovery Test
 - Input line disconnect/reconnect test
 - Pillar SIP will simulate primary port failure
 - Participants will reconnect to secondary port
 - Sequence number jump on participant input lines
 - Pillar SIP will disconnect both primary and secondary ports and simulate a sequence number jump
 - Participants will reconnect and perform Sequence Inquiry
 - Participants will submit messages as per latest sequence number
 - Pillar SIP to simulate hardware, network and software failure-recovery scenarios
- Output Failure Recovery Test
 - Pillar SIP will publish Reset Block Sequence Number (Category C Type L) message and simulate a sequence number jump on multicast lines
 - Subscribers will receive data and process the sequence number increase (not an actual message gap than can be retransmitted)
- Impaired Market Test
 - NYSE ARCA backing up all other markets with Official Closing Prices

WEEKEND TEST SCHEDULE

June 6, 2020 - Non-Functional Test

- Output Failure Recovery Test
 - Pillar SIP will failover output dissemination channels
 - Participants will continue to receive data

- Site Failover Test
 - Pillar SIP will failover from Primary (LDC) site to the Backup (RDC) site
 - Participants will establish connection to RDC and perform Sequence Inquiry
 - Participants will submit messages as per latest sequence number
 - Participants will continue to receive data on the multicast channels

- Impaired Market Test
 - The Nasdaq Market backing up NYSE ARCA with Official Closing Prices

WEEKEND TEST SCHEDULE

June 20, 2020 - Fallback Test

- Test Steps
 - Participants will submit quotes and trades to both Legacy and Pillar SIP
 - Notice will be issued that SIP is falling back to legacy NMS system
 - Pillar SIP will disable data publication on all output multicast channels
 - Legacy SIP will publish Reset Block Sequence Number (Category C Type L) message to bump up the sequence number on all multicast lines, to avoid confusion
 - Legacy SIP will continue data publication from latest received input message
 - Subscribers should confirm they are processing the multicast feeds from the legacy SIP.
 - After fallback, any Retransmission request will be handled only via legacy SIP and data will be retransmitted via legacy SIP retransmission lines
 - After fallback, Subscribers need to request Pillar SIP retransmissions from Start of Day, since Block Sequence Number are independent across both systems

PRODUCTION FINAL SOFTWARE TEST

Saturday, June 27, 2020

- Participants may repeat any functional message flow tests and participate in non-functional failure recovery and fallback test on the final software

PRODUCTION CONFIDENCE TEST

Saturday, July 11, 2020

- Participants will connect to their primary ports
- Participants can run through final tests to ensure readiness for go-live.