SIAC

Securities Industry
Automation Corporation

Retransmission Facility
User Guide

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CTS/CQS
Automated Retransmissions

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TCP/IP ADDRESSES **13**

REVISION HISTORY

Version	Date	Description
1.0	12/23/19	• Initial Version Document
1.1	01/29/20	• Updated section 3.7 Response Code
1.2	02/11/20	• Added reference for SIAC CTA Pillar SIP Connection Request Form
1.3	02/20/20	• Included redundant data stream for Retransmitted messages
1.4	04/20/20	• Updated retransmission facility availability timelines
1.4a	06/12/20	• Clarification for SIP Block Timestamp in retransmission block

REFERENCE MATERIAL

For CTA Technical Specifications visit www.ctaplan.com - and select Technical tab for the following:

- CTS and CQS Multicast Output Specification
- CTS and CQS Input Specification
- Common IP Multicast Distribution Network Specification
- SIAC CTA Pillar SIP Connection Request Form

For OPRA Technical Specifications visit www.opraplan.com and select Document Library tab for the following via the Output Specs Binary section:

- Autolink Facility User Guide
- Common IP Multicast Distribution Network Specification
- OPRA Binary DR Specification

FURTHER INFORMATION

- CTA Announcements including feed enhancements, traffic rates, etc. visit www.ctaplan.com
- OPRA Announcements including feed enhancements, traffic rates, etc. visit www.opraplan.com

FUTURE ENHANCEMENTS

Future enhancements and/or modifications may require system changes for your firm. Please refer to the CTA Plan website www.ctaplan.com to obtain the latest CTA Notifications and Technical Specification documents. To automatically receive these notifications by email, please subscribe at: https://www.ctaplan.com/subscribe. For OPRA Notifications and Technical Specification documents they can be located at: www.opraplan.com. To automatically receive these notifications by email, please subscribe at: OPRA Email Alerts

RELATED RESOURCES

For customers selecting to initiate connection through ICE Global Network (IGN), formerly known as the Secure Financial Transaction Infrastructure (SFTI)**:**

- Submit a request at: https://www.theice.com/contact-us/connectivity
- Contact IGN Sales at: clientnetworks@theice.com
- For more information on IGN, including documentation such as Customer and Technical guides reach out to an IGN representative at: iceglobalnetwork-info@theice.com

SECTION 1: Introduction

This document describes procedure for the retransmission of CTS and CQS data from CTA SIP on Pillar Platform. For retransmission of data from current CTA SIP and OPRA systems, please refer to existing 'Autolink Facility User Guide' document on ctaplan.com website.

1.1 Automated Retransmissions

SIAC supports an automated retransmissions of Consolidated Tape System (CTS), Consolidated Quotation System (CQS), and Options Price Reporting Authority (OPRA) data.

Data Subscribers who directly receive from SIAC any of the data feeds can connect to Retransmission Facility via the ICE Global Network (IGN) Communications Network. Data Subscribers will be required to provide their source addresses to facilitate the required provisioning/entitlement.

In addition to the IGN provisioning/entitlement requirements, Data Subscribers are also required to submit the SIAC CTA Pillar SIP Connection Request Form in order to obtain from SIAC a unique User ID/User Password by sending your request to the CQS-CTS-OPRA Product Management team at, CQS-CTS-OPRA@siac.com. Only one unique User ID/User Password is provided to direct connect Data Subscribers. Thus, clients of Service Providers would need to contact their provider to determine the mechanism employed for retransmission requests.

SECTION 2: Retransmission Facility

2.1 Overview

The Retransmission Facility is designed to provide direct users of CTS and CQS data with message retransmissions of stored data (not real-time) from the current trading day in the event the originally transmitted messages were not received. Data Subscribers can connect directly through SFTI to the Retransmission Facility via TCP/IP Addresses and Ports (see Appendix A).

Data Subscribers will be required to enter User ID/User Password, along with system, line, and sequence number information. Retransmissions will be disseminated over the current dedicated retransmission group multicast feeds.

2.2 Retransmission Messages

CTS and CQS disseminate redundant production data feeds (A&B Streams). In the event a multicast Data Subscriber misses messages on one production data stream, the missing messages are available from the other redundant production stream. If messages are missed from one or both production data streams, retransmissions of the stored data (not real-time) from the current trading day are available from the Retransmission Facility. Note: The retransmitted messages will be sent over two redundant retransmission data feeds.

For CTS and CQS, originally transmitted messages contain the alphabetic uppercase character 'O', in the Retransmission Indicator field of the Message Header. All retransmitted CTS and

CQS messages (sent as a result of a request received by the Retransmission Facility) contain the alphabetic upper case character 'V' in the Retransmission Indicator field of the Message Header.

2.3 Functionality

1. Connectivity to Request Server

   a) The Retransmission Facility supports two Request Servers per active data center to process retransmission requests of stored data (not real-time). Data Subscribers can connect to either one of the two request servers. A new connection will override the old connection i.e. if a client connects to second request server while it already had a connection established on first request server, previous connection will be disconnected.
   b) Only one connection is allowed on each Request server. Request server supports retransmission for both systems; CTS & CQS. Clients can request retransmission of either CQS or CTS messages via a retransmission request on the same connection.
   c) Clients may send several requests at the same time. Responses to all requests are published in the order in which they are received, although overlapping requests may be de-duplicated for efficiency.
   d) Duplicate requests of the same retransmissions being requested at the same time will not be processed.
   e) While it is possible to connect to the Request Server only as needed, and disconnecting after each request, the option is available to keep a connection established for the entire day
   f) Retransmission Facility for both CQS and CTS will be available during 1:30 AM - 8:05 PM, ET

2. Prevention of invalid Data Subscribers and invalid requests

   a) When making a connection, each Data Subscriber is identified by a unique User ID/User Password within a defined timeframe. If the User ID/User Password are not received within the specific timeframe (30 seconds), the connection will close.
   b) The retransmission request contains the Data Subscriber's unique User ID/User Password.
   c) Requests from invalid Data Subscribers will not be processed.
   d) Incorrectly formatted Retransmission requests or invalid login attempts will be rejected. Reaching a limit of 100 rejects will result in Denial-of-Service for a minimum of 60 seconds.

3. Provide Timely Retransmissions

   a) A maximum of 1 million CTS or CQS messages per request is allowed. Large requests will be broken down into smaller segments by the Retransmission Facility (Smaller requests will be processed in between segments of larger requests).
   b) If more than 1 million messages are required, multiple requests should be generated.
   c) Multiple retransmission requests can be placed in a packet (size of packet between Block Length and ETX is 1,002 bytes).

Functionality, continued

4. Retransmission Request Acknowledgements

Upon receiving retransmission request from a Data Subscriber, the system will send an acknowledgements back to the Data Subscriber with an appropriate response code, as listed under section '3.7 Response Code'

5. Message Sequence Number Rollover

Although unlikely, in the event of CTS or CQS message sequence number rollover, the Retransmission Facility will internally maintain the actual message sequence number (12 bytes). As such, the Data Subscriber would be required to request the actual message sequence number.

For example:

If a Data Subscriber experienced a gap before and after a message sequence number rollover from 4,294,967,292 to 0,000,000,003. The Data Subscriber would request a retransmission message using the actual message sequence numbers of 004,294,967,292 to 004,294,967,298.

Retransmission **Facility Actual Message Sequence Number 12 Bytes**	**Output Sequence Number 10 Bytes**
004,294,967,292	4,294,967,292
004,294,967,293	4,294,967,293
004,294,967,294	4,294,967,294
004,294,967,295	4,294,967,295
004,294,967,296 Reset Msg Seq Number	0,000,000,001 Reset Msg Seq Number
004,294,967,297	0,000,000,002
004,294,967,298	0,000,000,003

2.4 Retransmission Request Procedure

NOTE: REFERENCE SECTION 3 FOR THE BELOW FIELD DESCRIPTIONS

1) Establish a TCP/IP connection:

A Data Subscriber can establish a TCP/IP connection and enter either a login request message or a retransmission request message. After establishing a TCP/IP connection, if the Data Subscriber does **not** send any request message within the specific timeframe (30 seconds) the TCP/IP connection will close.

Upon receipt of the login or retransmission request, the Retransmission Facility will generate a response back to the Data Subscriber, after which the Data Subscriber can close the TCP/IP connection or leave the TCP/IP connection up for the remainder of the day.

2) Enter a Login Request:

Upon establishing a TCP/IP connection, a data subscribe can send a login request information (User ID/User Password). Login Request message is optional and retransmission can be requested without sending login message

Block Length	SOH	System	User ID	User Password	US	~~~	ETX
3	1	4	5	5	1		1

Example: 016<0x01>CTSA1234554321<0x03>

Login Response: Upon receipt of a Data Subscriber's login (User ID/User Password), the Retransmission Facility will send the following response which includes the original login request message information back to the Data Subscriber.

Block Length	SOH	Responding SIAC System	Response Code	System	User ID	User Password	US	~~~	ETX
3	1	4	2	4	5	5	1		1

Example: Successful connection (Response Code '01'):

022<0x01>CTSA01CTSA1234554321<0x03>

Retransmission Request Procedure, continued

3) Enter a Retransmission Request Message: A Data Subscriber is required to send the following retransmission request information regardless of whether or not they have already sent a login request.

Block Length	SOH	System	Multicast Line Number	Low Message Sequence Number	High Message Sequence Number	User ID	User Password	US	~~~	ETX
3	1	4	3	12	12	5	5	1		1

Example: If a Data Subscriber requests a retransmission for the range of messages with starting sequence number 1 and ending sequence number 5 whose user ID is '12345' and password is '54321', the request would look as follows:

043<0x01>CTSA00100000000000100000000000051234554321<0x03>

Retransmission Request Message Response: Upon receipt of a retransmission request message, the Retransmission Facility will send the following response which includes the original retransmission request message information back to the Data Subscriber.

Block Length	SOH	Responding SIAC System	Response Code	System	Multicast Line Number	Low Message Sequence Number	High Message Sequence Number	User ID	User Password	US	~~~	ETX
3	1	4	2	4	3	12	12	5	5	1		1

Example: Successful Request (Response Code '01'):

049<0x01>CTSA01OPRA00100000000000100000000000051234554321<0x03>

Note: All retransmitted messages (sent as a result of a request received by the Retransmission Facility) will only contain the alphabetic upper case character 'V' in the Retransmission Indicator field of the Message Header.

Note: Each block published on output multicast lines can contain multiple messages wherein Block Header contains Sequence Number of the first message in that block along with the number of messages in the block. Data Subscribers are required to keep track of total Message received over the multicast lines and request retransmission based on the sequence number of missed messages. Retransmitted blocks can be packed differently from the original blocks and will have SIP Block Timestamp representing when the first message in the retransmitted block was originally processed by SIP.

2.5 Retransmission Thresholds

Capability	Description	Threshold
User Authorization	Requests with valid User ID/User Password will be processed. Incoming requests from Data Subscribers that are not in the enabled user ID list will not be processed.	N/A
Maximum number of messages per request	A limit on the number of messages per request will be imposed. Note: If >1,000,000 the Data Subscriber must generate multiple TCP requests.	1,000,000
Smaller requests not penalized at the expense of larger requests	Large requests will be broken down into smaller segments (smaller requests will be processed in between segments of larger requests).	100,000
Maximum number of requests per day	A limit on the number of retransmission requests per day will be imposed per Data Subscriber.	10,000

SECTION 3: FIELD DESCRIPTIONS

3.1 Block Length

3 bytes, Numeric, Right Justified, Zero Filled. Indicates the total length of the message from the Start of Header (SOH) to the End of Text (ETX).

3.2 High Message Sequence Number

12 bytes, Numeric, Right Justified, Zero Filled. Identifies the end of the retransmission request message range.

3.3 Low Message Sequence Number

12 bytes, Numeric, Right Justified, Zero Filled. Identifies the start of the retransmission request message range.

3.4 Multicast Line Number

3 bytes, Numeric, Right Justified, Zero Filled. Indicates the multicast line number over which the retransmission should be generated.

System	Description	Multicast Line Number
CTSA	Tape A	001-012
CTSB	Tape B	001-012
CTSI	Index Tape A&B	001-002
CQSA	Tape A	001-012
CQSB	Tape B	001-012

Note: Reference the latest National Market System (NMS) Common IP Multicast Distribution Network Recipient Interface Specification for the CTS/CQS/OPRA Network and Multicast Line breakdown using the following links.

CTS/CQS Link: https://ctaplan.com and select the Technical tab.
OPRA Link: https://opraplan.com, select the Document Library Tab and locate the specificaion document via the Output Specs Binary.

3.5 SOH AND ETX (CTS and CQS Only)

1 byte, The Start of Header (SOH) control character (0x01) indicates the beginning of the block, whereas an End of Text (ETX) control character (0x03) signifies the end of the block.

3.6 US (CTS and CQS Only)

1 byte, The Unit Separator (US) control character (0x1F) is needed in multiple message blocks to signify the end of the preceding message but not the end of the block. An ETX control character delimits the last message.

SECTION 3: FIELD DESCRIPTIONS, continued

3.7 Response Code

2 bytes, Numeric. Indicates one of the following response codes:

00 – Connection refused
01 – Successful connection/request
02 – Invalid size
03 – Invalid system
04 – Invalid line
05 – Incorrect format
06 – Exceeded maximum retransmission request size
07 – Exceeded maximum number of retransmission requests
08 – Invalid message sequence number
09 – User ID or User Password
99 – Temporary Internal Error

3.8 System / Responding SIAC System

4 bytes, Alphabetic, Right Justified. Indicates one of the following system names for both the System the request is being sent to by the Data Subscriber and the Responding SIAC System.

System	Description
1) CTSA	Tape A
2) CTSB	Tape B
3) CTSI	Index - Tape A & B
4) CQSA	Tape A
5) CQSB	Tape B

3.9 User ID

5 bytes, Alpha Numeric, Right Justified. A unique identifier for each direct connect Data Subscriber (provided by SIAC).

3.10 User Password

5 bytes, Alpha Numeric, Right Justified. A unique password for each direct connect Data Subscriber (provided by SIAC).

Appendix A – TCP/IP Addresses/Ports

TCP/IP Addresses

	Production	Disaster Recovery
Request Primary	159.125.53.0/24	198.140.53.0/24
Request Backup	159.125.54.0/24	198.140.54.0/24

Note: Backup Data Center TCP/IP addresses activated only upon site failover.

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