



August 27, 2009

To: CQS, CTS, and OPRA Multicast Data Recipients

Subject: Automated Retransmissions

Modification

The purpose of this notice is to advise all CQS, CTS, and OPRA Data Recipients that SIAC is deploying an Enhanced Autolink Facility to support automated retransmissions (in the event the originally transmitted messages were not received), **beginning in September, 2009**. Direct multicast Data Recipients who receive any of the three data feeds can connect to Autolink.

Indirect Data Recipients must contact their service provider for retransmissions.

Enhanced Autolink

The Enhanced Autolink Facility will allow Data Recipients to connect directly through SFTI via predefined TCP/IP addresses. Two TCP/IP server ports will be available simultaneously on separate servers for connection.

In order to generate retransmissions more efficiently while reducing bandwidth the Enhanced Autolink Facility will not process duplicate retransmission requests received from Data Recipients (reference threshold in User Guide); therefore, all retransmitted CTS, CQS or OPRA messages (sent as a result of a request received by the Enhanced Autolink Facility) will only contain the alphabetic upper case character 'V' in the Retransmission Requestor field of the Message Header. As such, no other Retransmission Requestor ID will be supported in this new facility. Data Recipients will continue to enter user ID's and passwords, along with system, line, and sequence number information. Existing user ID's and passwords will be carried over into the Enhanced Autolink Facility. Retransmissions will continue to be disseminated over the dedicated retransmission group multicast feeds.

Implementation Timeframe

Implementation is scheduled for September, 2009. A six-month transition period to allow Data Recipients to migrate to the new facility will begin in September and will be completed in March, 2010.

User Guide

Attached please find the Enhanced Autolink User Guide. This specification provides information on connecting to the new facility, system functionality, and message formats.

Testing Scheduling

Support of Data Recipient testing will be available Tuesday and Thursday evenings, and Saturdays, beginning in September, 2009. To schedule testing, please register in the following way:

- E-mail your name, organization name, phone number, and date of test(s) to: CQS-CTS-OPRA@siac.com. To speak to the test coordinator, please contact William Gutierrez at 212.383.4908.

Indirect Data Recipients must contact their service provider to coordinate testing.

For information on how to receive CTS, CQS, and OPRA retransmission data, contact the SFTI Service Center at 866-873-7422.

Sincerely,

A handwritten signature in cursive script that reads "Michael Collazo".

Michael Collazo
Director
NMS Product Planning & Management

cc:
CTA/CQOC Policy & Technical Committees
OPRA Policy & Technical Committees
B. Faughnan
T. Demchak



Enhanced Autolink Facility User Guide

Date: August 27, 2009
Version: 1.1
CTS/CQS/OPRA
Automated Retransmissions

TABLE OF CONTENTS

DOCUMENT HISTORY	3
SECTION 1: INTRODUCTION	4
1.1 AUTOMATED RETRANSMISSIONS	4
SECTION 2: ENHANCED AUTOLINK FACILITY	4
2.1 OVERVIEW	4
2.2 RETRANSMISSION MESSAGES	4
2.3 WHY TCP VS. UDP?	5
2.4 SYSTEM DIAGRAM	5
2.5 FUNCTIONALITY	6
2.6 RETRANSMISSION REQUEST PROCEDURE	8
2.7 RETRANSMISSION THRESHOLDS	10
SECTION 3: FIELD DESCRIPTIONS	11
3.1 HIGH MESSAGE SEQUENCE NUMBER	11
3.2 LOW MESSAGE SEQUENCE NUMBER	11
3.3 MULTICAST LINE NUMBER	11
3.4 SOH AND ETX	11
3.5 US	11
3.6 RESPONSE CODE	11
3.7 SYSTEM / RESPONDING SIAC SYSTEM	12
3.8 USER ID	12
3.9 USER PASSWORD	12
APPENDIX A – IP ADDRESSES/PORTS	13

DOCUMENT HISTORY

Version	Date	Description
1.0	7/16/09	Draft Version Document
1.1	8/27/09	Initial Version Document

SECTION 1: Introduction

1.1 Automated Retransmissions

SIAC is deploying an Enhanced Autolink Facility to support automated retransmissions of Consolidated Tape System (CTS), Consolidate Quotation System (CQS), and Options Price Reporting Authority (OPRA) data. Direct multicast Data Recipients who receive any of the three data feeds can connect to Autolink via the Secure Financial Transaction Infrastructure (SFTI) Communications Network. For information on how to receive CTS, CQS, and OPRA retransmission data, contact the SFTI Service Center at 866-873-7422.

SECTION 2: Enhanced Autolink Facility

2.1 Overview

SIAC is migrating from the current retransmission request system, to an automated facility. The Enhanced Autolink Facility is designed to provide direct users of CTS, CQS and OPRA data with message retransmissions in the event the originally transmitted messages were not received. Data Recipients can connect directly through SFTI to the Enhanced Autolink Facility via TCP/IP addresses and ports.

Data Recipients will continue to enter user ID's and passwords, along with system, line, and sequence number information. Existing user ID's and passwords will be carried over into the Enhanced Autolink Facility. Retransmissions will continue to be disseminated over the current dedicated retransmission group multicast feeds.

2.2 Retransmission Messages

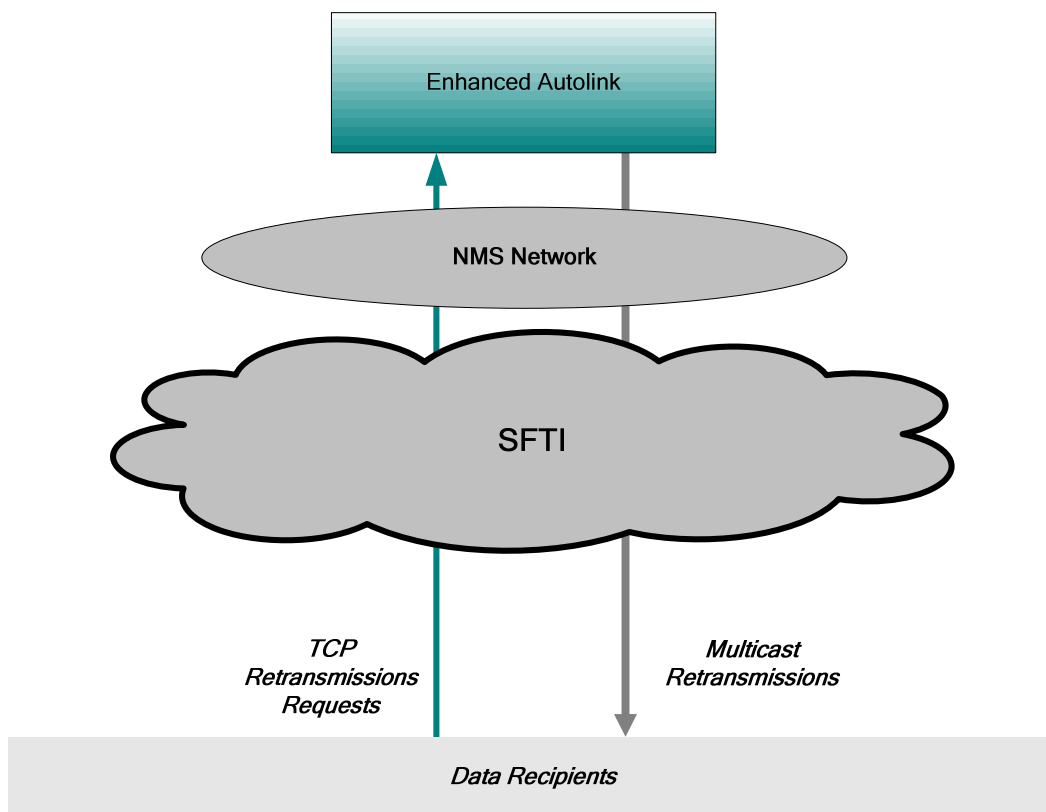
CTS, CQS, and OPRA disseminate redundant data feeds (A&B Streams). In the event a multicast recipient misses messages on one stream, the missing messages are available from the redundant stream. If messages are missed from both streams, retransmissions are available from the Enhanced Autolink Facility.

For CTS and CQS, originally transmitted messages contain the alphabetic uppercase character 'O', in the Retransmission Requestor field of the Message Header. Originally transmitted OPRA messages contain a 'blank' in the Retransmission Requestor field of the Message Header. All retransmitted CTS, CQS or OPRA messages (sent as a result of a request received by the Enhanced Autolink Facility) will only contain the alphabetic upper case character 'V' in the Retransmission Requestor field of the Message Header. As such, no other Retransmission Requestor ID will be supported in this new facility.

2.3 Why TCP vs. UDP?

1. More control is established over retransmissions (preventing a flood of UDP requests).
2. One connection for each requestor at a time is allowed on each server.
3. Return confirmation is provided to the requestor.
4. Verification of 'user ID' and "password" takes place before allowing a connection to be made.
5. Prevents a connection from being made if the maximum number of retransmission requests is exceeded.

2.4 System Diagram



2.5 Functionality

1. Dual Connections

- a) Two redundant servers are available to process retransmission requests. Either server can be used.
- b) Requests can be made to both servers simultaneously.
- c) Duplicate requests of the same retransmissions at the same time will not be processed (reference threshold on pg.10).
- d) The option is available to keep a connection established for the entire day.
- e) Connections will be accepted only during defined hours (CTS/CQS: 3:30 AM-8:30 PM, ET and OPRA 6:10 AM – 6:30 PM, ET)

2. Prevention of invalid Data Recipients and Multiple Connections on the same server

- a) When making a connection, each Data Recipient is identified by a unique user ID and password within a defined timeframe. If the user ID and password are not received within the specific timeframe (30 seconds), the connection will close.
- b) The retransmission request contains the Data Recipient's unique user ID and password.
- c) Requests from invalid Data Recipients will not be processed.
- d) Only one connection at a time can be established by a Data Recipient (user ID) on each server.

3. Provide Timely Retransmissions

- a) The retransmission request with the highest sequence number (most current) will be transmitted at a higher priority.
- b) A duplicate retransmission request will not be processed (reference threshold on pg.10).
- c) A maximum of 1 million CTS, CQS or OPRA messages per request is allowed. Large requests will be broken down into smaller segments by the Enhanced Autolink Facility. (Smaller requests will be processed in between segments of larger requests.)
- d) If more than 1 million messages are required, multiple requests should be generated.
- e) Multiple retransmission requests can be placed in a packet. (Size of packet between SOH and ETX is 1K bytes.)

4. Retransmission Request Acknowledgements

Upon receiving a CTS,CQS or OPRA retransmission request from a Data Recipient, the system will send one of the following acknowledgements back to the Data Recipient:

- a) The TCP/IP connection was refused.
- b) The request was processed normally.
- c) The request contained an invalid message size.
- d) A duplicate request was received.
- e) The request was rejected due to invalid system name, line, user ID, or password.
- f) The format of the request was incorrect.
- g) The request exceeded the number of messages per request.
- h) The request exceeded the number of requests per day.
- i) Invalid sequence number request.

Functionality, continued

5. Message Sequence Number Rollover

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

For example:

If a Data Recipient experienced an OPRA gap before and after a message sequence number rollover from 1,999,999,996 to 000,000,003. The Data Recipient would request a retransmission message using the actual message sequence numbers of 1,999,999,996 to 2,000,000,003.

Enhanced Autolink Facility Actual Message Sequence Number 12 Bytes	OPRA Output Sequence Number 10 Bytes
001,999,999,996	1,999,999,996
001,999,999,997	1,999,999,997
001,999,999,998	1,999,999,998
001,999,999,999	1,999,999,999
002,000,000,001 Reset Msg Seq Number	000,000,001 Reset Msg Seq Number
002,000,000,002	000,000,002
002,000,000,003	000,000,003

2.6 Retransmission Request Procedure

NOTE: REFERENCE SECTION 3 FOR THE BELOW FIELD DESCRIPTIONS

1) Establish a TCP/IP connection:

- A. A Data Recipient can establish a TCP/IP connection to enter a retransmission request message and upon receipt of the message the Enhanced Autolink Facility will generate a response back to the Data Recipient, after which the TCP/IP connection will close.
- B. A Data Recipient also has the option to establish and maintain their TCP/IP connection for the remainder of the day. If a Data Recipient chooses this option, they will be required to send the following login request information upon establishing a TCP/IP connection. If the Data Recipient does **not** send this information within the specific timeframe (30 seconds) the TCP/IP connection will close.

S	System	User ID	User Password	U	~	E
O				~	~	T
H	4	5	5	S	~	X

Example: <0x01>CTSA1234554321<0x03>

Connection Response: Upon receipt of a Data Recipient’s login (user ID/password), the Enhanced Autolink Facility will send the following response which includes the original login request message information back to the Data Recipient.

S	Responding SIAC System	Response Code	System	User ID	User Password	U	~	E
O						~	~	T
H	4	2	4	5	5	S	~	X

Example: Successful connection (Response Code ‘01’):

<0x01>CTSA01CTSA1234554321<0x03>

Retransmission Request Procedure, continued

- 2) **Enter a Retransmission Request Message:** A Data Recipient is required to send the following retransmission request information regardless of whether or not they have already established a TCP/IP connection.

S	System	Multicast Line Number	Low Message Sequence Number	High Message Sequence Number	User ID	User Password	U	~	E
O							S	~	T
H	4	3	12	12	5	5		~	X

Example: If a Data Recipient requests an OPRA 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:

<0x01>OPRA0010000000000010000000000051234554321<0x03>

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

S	Responding SIAC System	Response Code	System	Multicast Line Number	Low Message Sequence Number	High Message Sequence Number	User ID	User Password	U	~	E
O									S	~	T
H	4	2	4	3	12	12	5	5		~	X

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

<0x01>OPRA01OPRA0010000000000010000000000051234554321<0x03>

Note: All retransmitted CTS, CQS or OPRA messages (sent as a result of a request received by the Enhanced Autolink Facility) will only contain the alphabetic upper case character 'V' in the Retransmission Requestor field of the Message Header. As such, no other Retransmission Requestor ID will be supported in this new facility.

2.7 Retransmission Thresholds

Capability	Description	Threshold
User Authorization	Requests with valid user ID's/passwords will be processed. Incoming requests from Data Recipients that are not in the enabled user ID list will not be processed.	N/A
Priority	The higher sequence number retransmission request will take precedence.	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 recipient 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 requests per day will be imposed per Data Recipient.	500
Duplicate requests	Requests of the same range or within the same range received within a defined time frame, will be considered a duplicate, and will not be processed.	2 Minutes

SECTION 3: FIELD DESCRIPTIONS

3.1 High Message Sequence Number

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

3.2 Low Message Sequence Number

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

3.3 Multicast Line Number

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

3.4 SOH AND ETX

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.

3.5 US

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.

3.6 Response Code

2 bytes, Numeric. Indicates a successful request or one of the following response codes:

- 00 – Connection refused
- 01 – Successful connection/request
- 02 – Invalid size
- 03 – Invalid system, line, user ID, or password
- 04 – Duplicate request
- 05 – Incorrect format
- 06 – Exceeded maximum retransmission request size
- 07 – Exceeded maximum number of retransmission requests
- 08 – Invalid message sequence number

SECTION 3: FIELD DESCRIPTIONS, continued

3.7 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 Recipient and the Responding SIAC System.

- 1) CTSA (Network A)
- 2) CTSB (Network B)
- 3) CQSE (Network E)
- 4) CQSF (Network F)
- 5) OPRA

3.8 User ID

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

3.9 User Password

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

Appendix A – IP Addresses/Ports

IP Addresses:

Primary	
IP	Mask
198.140.61.177	255.255.255.248
198.140.62.177	255.255.255.248
Backup	
IP	Mask
198.140.41.177	255.255.255.248
198.140.42.177	255.255.255.248

Port Numbers:

System	Port Number
OPRA	30901
CTS	30903
CQS	30905