

FIX Servers Configured with Asynchronous Replication

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This document describes how the Asynchronous FIX Replication works from a client perspective. It also includes a number of examples.

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Table of contents

1	Logon after failover	5
2	Sample message flows	6
2.1	Failover with one lost NewOrderSingle	6
2.2	Failover with one lost OrderCancelRequest	8
2.3	Failover with one lost OrderCancelReplaceRequest	10
2.4	Failover with many lost messages	11
2.5	Connect/reconnect/failover with no lost messages.	14
A	Appendix—logon message NextExpectedMsgSeqNum processing	15

About this document

When running FIX Servers configured to use asynchronous replication, the client must be able to handle behavior not required by the FIX protocol.

A short summary of the new behavior:

1. Clients must adhere to the optional functionality in the FIX specification described by “Logon Message NextExpectedMsgSeqNum Processing”
2. Messages will be resent with the possible resend flag set when synchronizing after failover
3. A client resend request of messages may be responded to by the server with a gap fill (those messages lost in-flight during failover)

Thus the requirements do not conflict with or break the protocol, but do put an extended set of requirements on the clients. Each new behavior will be further detailed in this document, which illustrates the how and why of asynchronous replication.

Intended audience

Testers and clients.

Revision state history

This document has been revised according to the table below:

Revision state	Author	Comment
Rev 4.4-B May 12, 2011	Peter Eriksson	
Rev 4.4-A May 20	Cinnober	First official version
Rev 4.4-DA1 May 20, 2010	Jonas Fügedi	Initial version

1 Logon after failover

When logging on after a failover, the field `NextExpectedMsgSeqNum (789)` must be provided in the logon message. The reason for this is that we do not know what, if any messages were sent to the client and have not yet been replicated to the secondary. By receiving this next expected sequence number we can compare it to the last replicated sequence number and calculate the difference from the last replicated messages `LastMsgSeqNumProcessed (369)` field to the `NextExpectedMsgSeqNum (789)` provided by the client. The sequence number which the FIX server last processed will be used to populate the `NextExpectedMsgSeqNum (789)` in the logon response.

After logon after failover the client will be expected to resend the messages which were not replicated to the secondary server as specified by the `NextExpectedMsgSeqNum (789)`. These resent messages will be used to synchronize the cache in the FIX server. This logon behavior is documented in the FIX specification under the heading of “Logon Message `NextExpectedMsgSeqNum Processing`” as an optional method introduced in FIX 4.4.

Once the FIX server has synchronized with the back-end any outgoing messages resulting from the synchronization will be sent to the client with the `PossResend (97)` field set to true. In this manner the client will receive messages that have possibly been received previously when the secondary server synchronizes its caches, but no message will be lost.

If the client should ask for a resend of messages not replicated in a fail over, these will be replied to with a gap fill message (`SequenceReset (4)` message with the `GapFillFlag (123)` set to true). The reason for this is that we can not guarantee the order of the messages sent by the server (this is because the broadcasts from different partitions arrive in an arbitrary order). By responding with a gap fill we do not break protocol and by sending all messages that could possibly have been lost with the `PossResend (97)` field set we can guarantee that all messages are sent to the client.

2 Sample message flows

Some examples of the failover synchronization and recovery process as experienced by the FIX client through the FIX messages are provided to clearly illustrate the process.

2.1 Failover with one lost NewOrderSingle

In this scenario client inserts 5 NewOrderSingles to the primary site. For some reason the last message is not replicated to the secondary site. Then, the failover takes place and FS1S takes over. After the logon to FS1S, client resends all the messages with MsgSeqNum more or equal to the NextExpectedMsgSeqNum (6) in the logon response from FS1S (which in this case would be the last NewOrderSingle with MsgSeqNum = 6 and a SequenceReset message as a GapFillMessage instead of the Logon message with MsgSeqNum = 7). All the resend messages have PossDupFlag = Y. FS1S will send an ExecutionReport with PossResend = Y in response to the resending of the last NewOrderSingle.

1. Logon to FS1

- Outgoing: 8=FIX.4.4|9=93|35=A|34=1|49=CINFIX1|52=20100506-12:13:58.018|56=EXEC|98=0|108=30|553=CINFIX1|554=fff0|10=076|
- Incoming:
8=FIX.4.4|9=72|35=A|49=EXEC|56=CINFIX1|34=1|52=20100506-12:13:58.034|98=0|108=30|10=060|

2. Send 5 NewOrderSingle

- Outgoing: 8=FIX.4.4|9=172|35=D|34=2|49=CINFIX1|52=20100506-12:13:58.221|56=EXEC|11=Ord-1831944124965634|15=NOK|21=1|22=8|38=100|40=2|44=24|48=1273|54=2|55=[N/A]|58=not ever|60=20100506-12:13:58.221|10=185|
- Incoming (ExecutionReport NEW):
8=FIX.4.4|9=360|35=8|49=EXEC|56=CINFIX1|34=2|52=20100506-12:13:58.612|369=2|37=ON-1-1273148038471-1|11=Ord-1831944124965634|453=4|448=CINNOBER|447=D|452=4|448=CINNOBER|447=D|452=1|448=CINFIX1|447=D|452=36|448=CINNOBER|447=D|452=7|17=ON-1-1273148038471-1-7803|150=0|39=0|55=[N/A]|48=1273|22=8|54=2|38=100|44=24|15=NOK|59=0|151=100|14=0|6=0|60=20100506-12:13:58.471|58=not ever|10=170|
- Outgoing: 8=FIX.4.4|9=172|35=D|34=3|49=CINFIX1|52=20100506-12:14:00.221|56=EXEC|11=Ord-1831946118768422|15=NOK|21=1|22=8|38=100|40=2|44=24|48=1273|54=2|55=[N/A]|58=not ever|60=20100506-12:14:00.221|10=163|
- Incoming (ExecutionReport NEW):
8=FIX.4.4|9=360|35=8|49=EXEC|56=CINFIX1|34=3|52=20100506-12:14:00.221|369=3|37=ON-1-1273148040221-1|11=Ord-1831946118768422|453=4|448=CINNOBER|447=D|452=4|448=CINNOBER|447=D|452=1|448=CINFIX1|447=D|452=36|448=CINNOBER|447=D|452=7|17=ON-1-1273148040221-1-7836|150=0|39=0|55=[N/A]|48=1273|22=8|54=2|38=100|44=24|15=NOK|59=0|151=100|14=0|6=0|60=20100506-12:14:00.221|58=not ever|10=116|
- Outgoing: 8=FIX.4.4|9=172|35=D|34=4|49=CINFIX1|52=20100506-12:14:02.221|56=EXEC|11=Ord-1831948131215554|15=NOK|21=1|22=8|38=100|40=2|44=24|48=1273|54=2|55=[N/A]|58=not ever|60=20100506-12:14:02.221|10=158|

- Incoming (ExecutionReport NEW):
8=FIX.4.4|9=360|35=8|49=EXEC|56=CINFIX1|34=4|52=20100506-12:14:02.237|369=4|37=ON-1-1273148042221-1|11=Ord-1831948131215554|453=4|448=CINNOBER|447=D|452=4|448=CINNOBER|447=D|452=1|448=CINFIX1|447=D|452=36|448=CINNOBER|447=D|452=7|17=ON-1-1273148042221-1-7837|150=0|39=0|55=[N/A]|48=1273|22=8|54=2|38=100|44=24|15=NOK|59=0|151=100|14=0|6=0|60=20100506-12:14:02.221|58=not ever|10=124|
 - Outgoing: 8=FIX.4.4|9=172|35=D|34=5|49=CINFIX1|52=20100506-12:14:04.221|56=EXEC|11=Ord-1831950122220367|15=NOK|21=1|22=8|38=100|40=2|44=24|48=1273|54=2|55=[N/A]|58=not ever|60=20100506-12:14:04.221|10=154|
 - Incoming (ExecutionReport NEW):
8=FIX.4.4|9=360|35=8|49=EXEC|56=CINFIX1|34=5|52=20100506-12:14:04.221|369=5|37=ON-1-1273148044221-1|11=Ord-1831950122220367|453=4|448=CINNOBER|447=D|452=4|448=CINNOBER|447=D|452=1|448=CINFIX1|447=D|452=36|448=CINNOBER|447=D|452=7|17=ON-1-1273148044221-1-7838|150=0|39=0|55=[N/A]|48=1273|22=8|54=2|38=100|44=24|15=NOK|59=0|151=100|14=0|6=0|60=20100506-12:14:04.221|58=not ever|10=119|
 - Outgoing: 8=FIX.4.4|9=163|35=D|34=6|49=CINFIX1|52=20100506-12:14:06.221|56=EXEC|11=NOREPLICATE|15=NOK|21=1|22=8|38=100|40=2|44=24|48=1273|54=2|55=[N/A]|58=not ever|60=20100506-12:14:06.221|10=079|
 - Incoming (ExecutionReport NEW):
8=FIX.4.4|9=351|35=8|49=EXEC|56=CINFIX1|34=6|52=20100506-12:14:06.237|369=6|37=ON-1-1273148046221-1|11=NOREPLICATE|453=4|448=CINNOBER|447=D|452=4|448=CINNOBER|447=D|452=1|448=CINFIX1|447=D|452=36|448=CINNOBER|447=D|452=7|17=ON-1-1273148046221-1-7839|150=0|39=0|55=[N/A]|48=1273|22=8|54=2|38=100|44=24|15=NOK|59=0|151=100|14=0|6=0|60=20100506-12:14:06.221|58=not ever|10=057|
3. Failover from FS1 to FS1S
4. Logon to FS1S
- Outgoing: 8=FIX.4.4|9=93|35=A|34=7|49=CINFIX1|52=20100506-12:14:14.800|56=EXEC|98=0|108=30|553=CINFIX1|554=fff0|789=7|10=058|
 - Incoming:
8=FIX.4.4|9=72|35=A|49=EXEC|56=CINFIX1|34=7|52=20100506-12:14:14.893|98=0|108=30|789=6|10=055|
5. Client Resend, PossDupFlag = Y
- Outgoing:
8=FIX.4.4|9=194|35=D|34=6|43=Y|49=CINFIX1|52=20100506-12:14:14.909|56=EXEC|122=20100506-12:14:06.221|11=NOREPLICATE|15=NOK|21=1|22=8|38=100|40=2|44=24|48=1273|54=2|55=[N/A]|58=not ever|60=20100506-12:14:06.221|10=080|
 - Outgoing: 8=FIX.4.4|9=70|35=4|34=7|43=Y|49=CINFIX1|52=20100506-12:14:14.909|56=EXEC|36=8|123=Y|10=251|
6. FS1S sends ExecutionReport with PossResend = Y
- Incoming:
8=FIX.4.4|9=350|35=8|49=EXEC|56=CINFIX1|34=8|97=Y|52=20100506-

```
12:14:14.925|37=ON-1-1273148046221-
1|11=NOREPLICATE|453=4|448=CINNOBER|447=D|452=4|448=CINNOB
ER|447=D|452=1|448=CINFIX1|447=D|452=36|448=CINNOBER|447=D|
452=7|17=ON-1-1273148046221-1-
7839|150=0|39=0|55=[N/A]|48=1273|22=8|54=2|38=100|44=24|15=N
OK|59=0|151=100|14=0|6=0|60=20100506-12:14:06.221|58=not
ever|10=046|
```

Example

Seq Num	Server/Client	Message Type	Description
2	Client	D	Insert order
2	Server	8	Ack
3	Client	D	
3	Server	8	
4	Client	D	
4	Server	8	
5	Client	D	
5	Server	8	
6	Client	D	
6	Server	8	
			Failover from FS1 to FS1S
7	Client	A	789=7
7	Server	A	789=6 (the secondary server didn't receive the last order)
6	Client	D	43=Y (resend of order)
7	Client	4	36=8 (sequence reset)
8	Server	8	97=Y

2.2 Failover with one lost OrderCancelRequest

In this scenario client inserts 1 NewOrderSingle, and 1 OrderCancelRequest to the primary Site. For some reason OrderCancelRequest is not replicated to the secondary site. Then, the failover takes place and FS1S takes over. After the logon to FS1S, client resends all the messages with MsgSeqNum more or equal to the NextExpectedMsgSeqNum (3) in the logon response from FS1S (which in this case would be the OrderCancelRequest with MsgSeqNum = 3 and a SequenceReset message as a GapFillMessage instead of the Logon message with MsgSeqNum = 4). All the resend messages have PossDupFlag = Y. FS1S will send a Canceled ExecutionReport with PossResend = Y in response to the resending of the OrderCancelRequest.

1. Logon to FS1

- Outgoing: 8=FIX.4.4|9=93|35=A|34=1|49=CINFIX1|52=20100506-12:24:45.052|56=EXEC|98=0|108=30|553=CINFIX1|554=fff0|10=072|
- 14:24:45 Incoming:
8=FIX.4.4|9=72|35=A|49=EXEC|56=CINFIX1|34=1|52=20100506-12:24:45.208|98=0|108=30|10=061|

2. Send NewOrderSingle and OrderCancelRequest

- Outgoing: 8=FIX.4.4|9=172|35=D|34=2|49=CINFIX1|52=20100506-12:24:45.052|56=EXEC|11=Ord-1832590882312042|15=NOK|21=1|22=8|38=100|40=2|44=24|48=1734|54=2|55=[N/A]|58=not ever|60=20100506-12:24:45.052|10=175|

- Incoming (ExecutionReport NEW):
8=FIX.4.4|9=360|35=8|49=EXEC|56=CINFIX1|34=2|52=20100506-12:24:45.599|369=2|37=ON-1-1273148685458-1|11=Ord-1832590882312042|453=4|448=CINNOBER|447=D|452=4|448=CINNOBER|447=D|452=1|448=CINFIX1|447=D|452=36|448=CINNOBER|447=D|452=7|17=ON-1-1273148685458-1-7899|150=0|39=0|55=[N/A]|48=1734|22=8|54=2|38=100|44=24|15=NOK|59=0|151=100|14=0|6=0|60=20100506-12:24:45.458|58=not ever|10=216|
 - Outgoing: 8=FIX.4.4|9=152|35=F|34=3|49=CINFIX1|52=20100506-12:24:47.052|56=EXEC|11=NOREPLICATE|22=8|38=100|41=Ord-1832590882312042|48=1734|54=2|55=[N/A]|60=20100506-12:24:47.052|10=129|
 - Incoming (ExecutionReport PENDING_CANCEL):
8=FIX.4.4|9=228|35=8|49=EXEC|56=CINFIX1|34=3|52=20100506-12:24:47.052|369=2|37=ON-1-1273148685458-1|11=NOREPLICATE|41=Ord-1832590882312042|17=830582725|150=6|39=6|55=[N/A]|48=1734|22=8|54=2|38=100|44=24|15=NOK|59=0|151=100|14=0|6=0|58=not ever|10=032|
 - Incoming (ExecutionReport CANCELED):
8=FIX.4.4|9=373|35=8|49=EXEC|56=CINFIX1|34=4|52=20100506-12:24:47.067|369=3|37=ON-1-1273148685458-1|11=NOREPLICATE|41=Ord-1832590882312042|453=4|448=CINNOBER|447=D|452=4|448=CINNOBER|447=D|452=1|448=CINFIX1|447=D|452=36|448=CINNOBER|447=D|452=7|17=ON-1-1273148685458-1-7900|150=4|39=4|55=[N/A]|48=1734|22=8|54=2|38=100|44=24|15=NOK|59=0|151=0|14=0|6=0|60=20100506-12:24:45.458|58=not ever|10=070|
3. Failover From FS1 to FS1S
4. Logon to FS1S
- Outgoing: 8=FIX.4.4|9=93|35=A|34=4|49=CINFIX1|52=20100506-12:24:56.942|56=EXEC|98=0|108=30|553=CINFIX1|554=fff0|789=5|10=067|
 - Incoming:
8=FIX.4.4|9=72|35=A|49=EXEC|56=CINFIX1|34=5|52=20100506-12:24:57.021|98=0|108=30|789=3|10=041|
5. Client Resend with PossDupFlag = Y
- Outgoing:
8=FIX.4.4|9=183|35=F|34=3|43=Y|49=CINFIX1|52=20100506-12:24:57.021|56=EXEC|122=20100506-12:24:47.052|11=NOREPLICATE|22=8|38=100|41=Ord-1832590882312042|48=1734|54=2|55=[N/A]|60=20100506-12:24:47.052|10=123|
 - Outgoing: 8=FIX.4.4|9=70|35=4|34=4|43=Y|49=CINFIX1|52=20100506-12:24:57.021|56=EXEC|36=5|123=Y|10=238|
6. FS1S sends a Canceled ExecutionReport with PossResend = Y
- Incoming:
8=FIX.4.4|9=348|35=8|49=EXEC|56=CINFIX1|34=6|97=Y|52=20100506-12:24:58.536|37=ON-1-1273148685458-1|11=NOREPLICATE|453=4|448=CINNOBER|447=D|452=4|448=CINNOBER|447=D|452=1|448=CINFIX1|447=D|452=36|448=CINNOBER|447=D|452=7|17=ON-1-1273148685458-1-7900|150=4|39=4|55=[N/A]|48=1734|22=8|54=2|38=100|44=24|15=N

OK|59=0|151=0|14=0|6=0|60=20100506-12:24:45.458|58=not
ever|10=018|

2.3 Failover with one lost OrderCancelReplaceRequest

In this scenario client inserts 1 NewOrderSingle, and 1 OrderCancelReplaceRequest to the primary Site. For some reason OrderCancelReplaceRequest is not replicated to the secondary site. Then, the failover takes place and FS1S takes over. After the logon to FS1S, client resends all the messages with MsgSeqNum more or equal to the NextExpectedMsgSeqNum (3) in the logon response from FS1S (which in this case would be the OrderCancelReplaceRequest with MsgSeqNum = 3 and a SequenceReset message as a GapFillMessage instead of the Logon message with MsgSeqNum = 4). All the resend messages have PossDupFlag = Y. FS1S will send a New ExecutionReport with PossResend = Y in response to the resending of the OrderCancelReplaceRequest.

1. Logon to FS1

- Outgoing: 8=FIX.4.4|9=93|35=A|34=1|49=CINFIX1|52=20100506-12:27:12.489|56=EXEC|98=0|108=30|553=CINFIX1|554=fff0|10=083|
- Incoming:
8=FIX.4.4|9=72|35=A|49=EXEC|56=CINFIX1|34=1|52=20100506-12:27:12.677|98=0|108=30|10=068|

2. Send NewOrderSingle and OrderCancelReplaceRequest

- Outgoing: 8=FIX.4.4|9=172|35=D|34=2|49=CINFIX1|52=20100506-12:27:12.489|56=EXEC|11=Ord-1832738302410733|15=NOK|21=1|22=8|38=100|40=2|44=24|48=1887|54=2|55=[N/A]|58=not ever|60=20100506-12:27:12.489|10=203|
- Incoming (ExecutionReport NEW):
8=FIX.4.4|9=360|35=8|49=EXEC|56=CINFIX1|34=2|52=20100506-12:27:13.146|369=2|37=ON-1-1273148832927-1|11=Ord-1832738302410733|453=4|448=CINNOBER|447=D|452=4|448=CINNOBER|447=D|452=1|448=CINFIX1|447=D|452=36|448=CINNOBER|447=D|452=7|17=ON-1-1273148832927-1-7835|150=0|39=0|55=[N/A]|48=1887|22=8|54=2|38=100|44=24|15=NOK|59=0|151=100|14=0|6=0|60=20100506-12:27:12.927|58=not ever|10=186|
- Outgoing: 8=FIX.4.4|9=163|35=G|34=3|49=CINFIX1|52=20100506-12:27:14.505|56=EXEC|11=NOREPLICATE|22=8|38=200|40=2|41=Ord-1832738302410733|44=48|48=1887|54=2|55=[N/A]|60=20100506-12:27:14.505|10=113|
- Incoming (ExecutionReport PENDING_REPLACE):
8=FIX.4.4|9=228|35=8|49=EXEC|56=CINFIX1|34=3|52=20100506-12:27:14.505|369=2|37=ON-1-1273148832927-1|11=NOREPLICATE|41=Ord-1832738302410733|17=761461384|150=E|39=E|55=[N/A]|48=1887|22=8|54=2|38=100|44=24|15=NOK|59=0|151=100|14=0|6=0|58=not ever|10=063|
- Incoming (ExecutionReport REPLACED):
8=FIX.4.4|9=363|35=8|49=EXEC|56=CINFIX1|34=4|52=20100506-12:27:14.521|369=3|37=ON-1-1273148832927-1|11=NOREPLICATE|41=Ord-1832738302410733|453=4|448=CINNOBER|447=D|452=4|448=CINNOBER|447=D|452=1|448=CINFIX1|447=D|452=36|448=CINNOBER|447=D|452=7|17=ON-1-1273148832927-1-7868|150=5|39=0|55=[N/A]|48=1887|22=8|54=2|38=200|44=48|15=NOK|59=0|151=200|14=0|6=0|60=20100506-12:27:14.505|10=214|

3. Failover From FS1 to FS1S
4. Logon to FS1S
 - Outgoing: 8=FIX.4.4|9=93|35=A|34=4|49=CINFIX1|52=20100506-12:27:24.958|56=EXEC|98=0|108=30|553=CINFIX1|554=fff0|789=5|10=072|
 - Incoming: 8=FIX.4.4|9=72|35=A|49=EXEC|56=CINFIX1|34=5|52=20100506-12:27:25.021|98=0|108=30|789=3|10=039|
5. Client Resend with PossDupFlag = Y
 - Outgoing: 8=FIX.4.4|9=194|35=G|34=3|43=Y|49=CINFIX1|52=20100506-12:27:25.052|56=EXEC|122=20100506-12:27:14.505|11=NOREPLICATE|22=8|38=200|40=2|41=Ord-1832738302410733|44=48|48=1887|54=2|55=[N/A]|60=20100506-12:27:14.505|10=109|
 - Outgoing: 8=FIX.4.4|9=70|35=4|34=4|43=Y|49=CINFIX1|52=20100506-12:27:25.052|56=EXEC|36=5|123=Y|10=240|
6. FS1S sends a New ExecutionReport with PossResend = Y
 - Incoming: 8=FIX.4.4|9=362|35=8|49=EXEC|56=CINFIX1|34=6|97=Y|52=20100506-12:27:25.067|37=ON-1-1273148832927-1|11=NOREPLICATE|41=Ord-1832738302410733|453=4|448=CINNOBER|447=D|452=4|448=CINNOBER|447=D|452=1|448=CINFIX1|447=D|452=36|448=CINNOBER|447=D|452=7|17=ON-1-1273148832927-1-7868|150=5|39=0|55=[N/A]|48=1887|22=8|54=2|38=200|44=48|15=NOK|59=0|151=200|14=0|6=0|60=20100506-12:27:14.505|10=210|

2.4 Failover with many lost messages

In this scenario none of the messages sent by client to FS1 are replicated to the FS1S. So, after failover to FS1S client has two options: resend all the messages with PossDupFlag = Y to FS1S, or send a GapFillMessage to upgrade the incoming message sequence number of the FS1S (in this scenario FS1S will change the MsgSeqNum from 2 to 8). Sending the first NewOrderSingle to FS1S will result in FS1S to resend all the previously received execution reports with PossResend = Y.

1. Logon to FS1
 - Outgoing: 8=FIX.4.4|9=93|35=A|34=1|49=CINFIX1|52=20100506-12:45:07.583|56=EXEC|98=0|108=30|553=CINFIX1|554=fff0|10=082|
 - Incoming: 8=FIX.4.4|9=72|35=A|49=EXEC|56=CINFIX1|34=1|52=20100506-12:45:07.755|98=0|108=30|10=069|
2. Send five NewOrderSingles
 - Outgoing: 8=FIX.4.4|9=163|35=D|34=2|49=CINFIX1|52=20100506-12:45:07.583|56=EXEC|11=NOREPLICATE|15=NOK|21=1|22=8|38=100|40=2|44=24|48=1954|54=2|55=[N/A]|58=not ever|60=20100506-12:45:07.583|10=113|
 - Incoming (ExecutionReport NEW): 8=FIX.4.4|9=351|35=8|49=EXEC|56=CINFIX1|34=2|52=20100506-12:45:08.130|369=2|37=ON-1-1273149907989-1|11=NOREPLICATE|453=4|448=CINNOBER|447=D|452=4|448=CINNOBER|447=D|452=1|448=CINFIX1|447=D|452=36|448=CINNOBER|447=D|452=7|17=ON-1-1273149907989-1-7899|150=0|39=0|55=[N/A]|48=1954|22=8|54=2|38=100|44=24|15=N

OK | 59=0 | 151=100 | 14=0 | 6=0 | 60=20100506-12:45:07.989 | 58=not ever | 10=141 |

- Outgoing: 8=FIX.4.4 | 9=172 | 35=D | 34=3 | 49=CINFIX1 | 52=20100506-12:45:09.583 | 56=EXEC | 11=Ord-1833815295642371 | 15=NOK | 21=1 | 22=8 | 38=100 | 40=2 | 44=24 | 48=1954 | 54=2 | 55=[N/A] | 58=not ever | 60=20100506-12:45:09.583 | 10=214 |
- Incoming (ExecutionReport NEW):
8=FIX.4.4 | 9=360 | 35=8 | 49=EXEC | 56=CINFIX1 | 34=3 | 52=20100506-12:45:09.599 | 369=3 | 37=ON-1-1273149909599-1 | 11=Ord-1833815295642371 | 453=4 | 448=CINNOBER | 447=D | 452=4 | 448=CINNOBER | 447=D | 452=1 | 448=CINFIX1 | 447=D | 452=36 | 448=CINNOBER | 447=D | 452=7 | 17=ON-1-1273149909599-1-7900 | 150=0 | 39=0 | 55=[N/A] | 48=1954 | 22=8 | 54=2 | 38=100 | 44=24 | 15=NOK | 59=0 | 151=100 | 14=0 | 6=0 | 60=20100506-12:45:09.599 | 58=not ever | 10=239 |
- Outgoing: 8=FIX.4.4 | 9=172 | 35=D | 34=4 | 49=CINFIX1 | 52=20100506-12:45:11.692 | 56=EXEC | 11=Ord-1833817394015780 | 15=NOK | 21=1 | 22=8 | 38=100 | 40=2 | 44=24 | 48=1954 | 54=2 | 55=[N/A] | 58=not ever | 60=20100506-12:45:11.692 | 10=203 |
- Incoming (ExecutionReport NEW):
8=FIX.4.4 | 9=360 | 35=8 | 49=EXEC | 56=CINFIX1 | 34=4 | 52=20100506-12:45:11.692 | 369=4 | 37=ON-1-1273149911692-1 | 11=Ord-1833817394015780 | 453=4 | 448=CINNOBER | 447=D | 452=4 | 448=CINNOBER | 447=D | 452=1 | 448=CINFIX1 | 447=D | 452=36 | 448=CINNOBER | 447=D | 452=7 | 17=ON-1-1273149911692-1-7933 | 150=0 | 39=0 | 55=[N/A] | 48=1954 | 22=8 | 54=2 | 38=100 | 44=24 | 15=NOK | 59=0 | 151=100 | 14=0 | 6=0 | 60=20100506-12:45:11.692 | 58=not ever | 10=195 |
- Outgoing: 8=FIX.4.4 | 9=172 | 35=D | 34=5 | 49=CINFIX1 | 52=20100506-12:45:13.786 | 56=EXEC | 11=Ord-1833819502131922 | 15=NOK | 21=1 | 22=8 | 38=100 | 40=2 | 44=24 | 48=1954 | 54=2 | 55=[N/A] | 58=not ever | 60=20100506-12:45:13.786 | 10=206 |
- Incoming (ExecutionReport NEW):
8=FIX.4.4 | 9=360 | 35=8 | 49=EXEC | 56=CINFIX1 | 34=5 | 52=20100506-12:45:13.802 | 369=5 | 37=ON-1-1273149913802-1 | 11=Ord-1833819502131922 | 453=4 | 448=CINNOBER | 447=D | 452=4 | 448=CINNOBER | 447=D | 452=1 | 448=CINFIX1 | 447=D | 452=36 | 448=CINNOBER | 447=D | 452=7 | 17=ON-1-1273149913802-1-7934 | 150=0 | 39=0 | 55=[N/A] | 48=1954 | 22=8 | 54=2 | 38=100 | 44=24 | 15=NOK | 59=0 | 151=100 | 14=0 | 6=0 | 60=20100506-12:45:13.802 | 58=not ever | 10=168 |
- Outgoing: 8=FIX.4.4 | 9=172 | 35=D | 34=6 | 49=CINFIX1 | 52=20100506-12:45:15.880 | 56=EXEC | 11=Ord-1833821592761090 | 15=NOK | 21=1 | 22=8 | 38=100 | 40=2 | 44=24 | 48=1954 | 54=2 | 55=[N/A] | 58=not ever | 60=20100506-12:45:15.880 | 10=208 |
- Incoming (ExecutionReport NEW):
8=FIX.4.4 | 9=360 | 35=8 | 49=EXEC | 56=CINFIX1 | 34=6 | 52=20100506-12:45:15.896 | 369=6 | 37=ON-1-1273149915880-1 | 11=Ord-1833821592761090 | 453=4 | 448=CINNOBER | 447=D | 452=4 | 448=CINNOBER | 447=D | 452=1 | 448=CINFIX1 | 447=D | 452=36 | 448=CINNOBER | 447=D | 452=7 | 17=ON-1-1273149915880-1-7935 | 150=0 | 39=0 | 55=[N/A] | 48=1954 | 22=8 | 54=2 | 38=100 | 44=24 | 15=NOK | 59=0 | 151=100 | 14=0 | 6=0 | 60=20100506-12:45:15.880 | 58=not ever | 10=217 |

3. Failover from FS1 to FS1S

4. Logon to FS1S

- Outgoing: 8=FIX.4.4|9=93|35=A|34=7|49=CINFIX1|52=20100506-12:45:24.286|56=EXEC|98=0|108=30|553=CINFIX1|554=fff0|789=7|10=071|
 - Incoming (NextExpectedMsgSeqNum = 2):
8=FIX.4.4|9=72|35=A|49=EXEC|56=CINFIX1|34=7|52=20100506-12:45:24.364|98=0|108=30|789=2|10=049|
5. Client Sends a SequenceReset message with PossDupFlag = Y (NewSeqNo = 8)
- Outgoing: 8=FIX.4.4|9=70|35=4|34=2|43=Y|49=CINFIX1|52=20100506-12:45:24.380|56=EXEC|36=8|123=Y|10=244|
6. Client sends a NewOrderSingle with MsgSeqNum = 8
- Outgoing: 8=FIX.4.4|9=172|35=D|34=8|49=CINFIX1|52=20100506-12:45:24.380|56=EXEC|11=Ord-1833830084445974|15=NOK|21=1|22=8|38=100|40=2|44=24|48=1954|54=2|55=[N/A]|58=not ever|60=20100506-12:45:24.380|10=206|
7. FS1S resends 5 ExecutionReports NEW, and an ExecutionReport for the latest NewOrderSingle
- Incoming (ExecutionReport NEW, PossResend = Y, MsgSeqNum = 8):
:8=FIX.4.4|9=356|35=8|49=EXEC|56=CINFIX1|34=8|97=Y|52=20100506-12:45:24.427|369=8|37=ON-1-1273149907989-1|11=NOREPLICATE|453=4|448=CINNOBER|447=D|452=4|448=CINNOBER|447=D|452=1|448=CINFIX1|447=D|452=36|448=CINNOBER|447=D|452=7|17=ON-1-1273149907989-1-7899|150=0|39=0|55=[N/A]|48=1954|22=8|54=2|38=100|44=24|15=NOK|59=0|151=100|14=0|6=0|60=20100506-12:45:07.989|58=not ever|10=172|
 - Incoming (ExecutionReport NEW, PossResend = Y, MsgSeqNum = 9):
8=FIX.4.4|9=365|35=8|49=EXEC|56=CINFIX1|34=9|97=Y|52=20100506-12:45:24.427|369=8|37=ON-1-1273149909599-1|11=Ord-1833815295642371|453=4|448=CINNOBER|447=D|452=4|448=CINNOBER|447=D|452=1|448=CINFIX1|447=D|452=36|448=CINNOBER|447=D|452=7|17=ON-1-1273149909599-1-7900|150=0|39=0|55=[N/A]|48=1954|22=8|54=2|38=100|44=24|15=NOK|59=0|151=100|14=0|6=0|60=20100506-12:45:09.599|58=not ever|10=249|
 - Incoming (ExecutionReport NEW, PossResend = Y, MsgSeqNum = 10):
8=FIX.4.4|9=366|35=8|49=EXEC|56=CINFIX1|34=10|97=Y|52=20100506-12:45:24.427|369=8|37=ON-1-1273149911692-1|11=Ord-1833817394015780|453=4|448=CINNOBER|447=D|452=4|448=CINNOBER|447=D|452=1|448=CINFIX1|447=D|452=36|448=CINNOBER|447=D|452=7|17=ON-1-1273149911692-1-7933|150=0|39=0|55=[N/A]|48=1954|22=8|54=2|38=100|44=24|15=NOK|59=0|151=100|14=0|6=0|60=20100506-12:45:11.692|58=not ever|10=001|
 - Incoming (ExecutionReport NEW, PossResend = Y, MsgSeqNum = 11):
8=FIX.4.4|9=366|35=8|49=EXEC|56=CINFIX1|34=11|97=Y|52=20100506-12:45:24.427|369=8|37=ON-1-1273149913802-1|11=Ord-1833819502131922|453=4|448=CINNOBER|447=D|452=4|448=CINNOBER|447=D|452=1|448=CINFIX1|447=D|452=36|448=CINNOBER|447=D|452=7|17=ON-1-1273149913802-1-7934|150=0|39=0|55=[N/A]|48=1954|22=8|54=2|38=100|44=24|15=NOK|59=0|151=100|14=0|6=0|60=20100506-12:45:13.802|58=not ever|10=234|
 - Incoming (ExecutionReport NEW, PossResend = Y, MsgSeqNum = 12):
8=FIX.4.4|9=366|35=8|49=EXEC|56=CINFIX1|34=12|97=Y|52=20100506-12:45:24.427|369=8|37=ON-1-1273149915880-1|11=Ord-

1833821592761090|453=4|448=CINNOBER|447=D|452=4|448=CINNOBER|447=D|452=1|448=CINFIX1|447=D|452=36|448=CINNOBER|447=D|452=7|17=ON-1-1273149915880-1-7935|150=0|39=0|55=[N/A]|48=1954|22=8|54=2|38=100|44=24|15=NOK|59=0|151=100|14=0|6=0|60=20100506-12:45:15.880|58=not ever|10=011|

- Incoming (ExecutionReport NEW, MsgSeqNum = 13):
8=FIX.4.4|9=361|35=8|49=EXEC|56=CINFIX1|34=13|52=20100506-12:45:24.427|369=8|37=ON-1-1273149924411-1|11=Ord-1833830084445974|453=4|448=CINNOBER|447=D|452=4|448=CINNOBER|447=D|452=1|448=CINFIX1|447=D|452=36|448=CINNOBER|447=D|452=7|17=ON-1-1273149924411-1-7968|150=0|39=0|55=[N/A]|48=1954|22=8|54=2|38=100|44=24|15=NOK|59=0|151=100|14=0|6=0|60=20100506-12:45:24.411|58=not ever|10=238|

2.5 Connect/reconnect/failover with no lost messages.

In this scenario client sends messages to the primary site and none of the messages are lost during the replication. After failover to the secondary site, there is no need of client resend since FS1S has the full knowledge over the previously sent messages. So, client just has to logon to FS1S and presume the process of sending messages. (NextExpectedMsgSeqNum in the logon response from FS1S is equal to the MsgSeqNum + 1 of the last message sent by client, which in this case is the next expected sequence number.).

Example first logon of the day.

Seq Num	Server/Client	Message Type	Description
1	Client	A	789=1
1	Server	A	789=2

A Appendix—logon message NextExpectedMsgSeqNum processing

Text copied from “FIX Session Protocol” specification found in “FIX_Transport_1.1.pdf” freely available from fixprotocol.org.

The NextExpectedMsgSeqNum (789) field has been added in FIX 4.4 to the Logon message to support a proposed new way to resynchronize a FIX session. This new method is optional and its use should be bilaterally agreed upon between counterparties.

NextExpectedMsgSeqNum (789) is used as follows:

In its Logon request the session initiator supplies in NextExpectedMsgSeqNum (789) the value next expected from the session acceptor in MsgSeqNum (34). The outgoing header MsgSeqNum (34) of the Logon request is assigned the next-to-be-assigned sequence number as usual.

The session acceptor validates the Logon request including that NextExpectedMsgSeqNum (789) does not represent a gap. It then constructs its Logon response with NextExpectedMsgSeqNum (789) containing the value next expected from the session initiator in MsgSeqNum (34) having incremented the number above the Logon request if that was the sequence expected. The outgoing header MsgSeqNum (34) is constructed as usual.

The session initiator waits to begin sending application messages until it receives the Logon response. When it is received the initiator validates the response including that NextExpectedMsgSeqNum (789) does not represent a gap.

Both sides react to NextExpectedMsgSeqNum (789) from its counterparty thus:

- If equal to the next-to-be-assigned sequence, proceed sending new messages beginning with that number.
- If lower than the next-to-be-assigned sequence, "recover" (see "Message Recovery") all messages from the last message delivered prior to this Logon through the specified NextExpectedMsgSeqNum (789) sending them in order; then Gap Fill over the sequence number used in Logon and proceed sending newly queued messages with a sequence number one higher than the original Logon.
- If higher than the next-to-be-assigned sequence, send Logout to abort the session.

Neither side should generate a ResendRequest based on MsgSeqNum (34) of the incoming Logon message but should expect any gaps to be filled automatically. If a gap is produced by the Logon message MsgSeqNum (34), the receive logic should expect the gap to be filled automatically prior to receiving any messages with sequences above the gap.