ISO8583 – A layman's guide to understanding the ISO8583 Financial Transaction Message

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Before we look into the International Standard ISO8583, let us look at the definition of the term **standard**. The International Organization for Standardization (ISO) differentiates between standards and regulations as follows [1]:

- A standard is a "document approved by a recognized body that provides, for common and repeated use, rules, guidelines, or characteristics for products, processes or services with which compliance is not mandatory." There are numerous standards in use covering everything from thermal stability of hydraulic fluids to the size of computer diskettes.

- A regulation is a "document, which lays down product, process or service characteristics, including the applicable administrative provisions, with which compliance is mandatory." Building codes are an example of regulations.

Care must be used in discussing standards and regulations since there is a vast gray area between the two; for example:

Standards often begin as guidelines that describe a preferred approach, and later, with widespread adoption, become de facto regulations (e.g., the use of the Critical Path Method for scheduling major construction projects).

Compliance may be mandated at different levels (e.g., by a government agency, by the management of the performing organization, or by the project management team).

For many financial projects, standards and regulations (by whatever definition) are well known, and project plans can reflect their effects. In other cases, the influence is unknown or uncertain and must be considered under Project Risk Management.

It is therefore possible that some financial service providers do not follow the ISO8583 standard strictly. However, in many cases, this is not recommended as the purpose of creating a standard is to enable different systems communicate with each other and to make sure that when the financial service is extended to a new system, the integration process would be a breeze.

Now, we take a look at ISO8583 standard. Due to the nature of this standard, all the details written below are accumulated from the experience of the author and not taken from any copyrighted material.

[1] International Organization for Standardization. 1994. Code of Good Practice for Standardization (Draft International Standard). Geneva, Switzerland: ISO Press.

The ISO8583 Message Structure

The ISO8583 message consists of a *Message Type Identifier*, *Bitmaps*, and *Data elements*.

Message Type Identifier	Bitmaps	Data Elements

A *Message Type Identifier* is a four digit numeric field that describes each message class and function. Some common *Message Type Identifiers* are as below:

First 2 digits of the Message Type Identifier	Description
02XX	Financial Transaction Messages
04XX	Reversal Messages
08XX	Network Management Messages

Financial transaction messages are messages with the identifier of 02XX. In a normal situation, it starts with 0200 from the requester and the responder will send a message with a header of 0210 stating that it is a response from the request earlier.

System A	→	System B

Send 0200XXXXX
Request Message

Process Request
Message

System A	←	System B

Receive Response
Transaction Finished

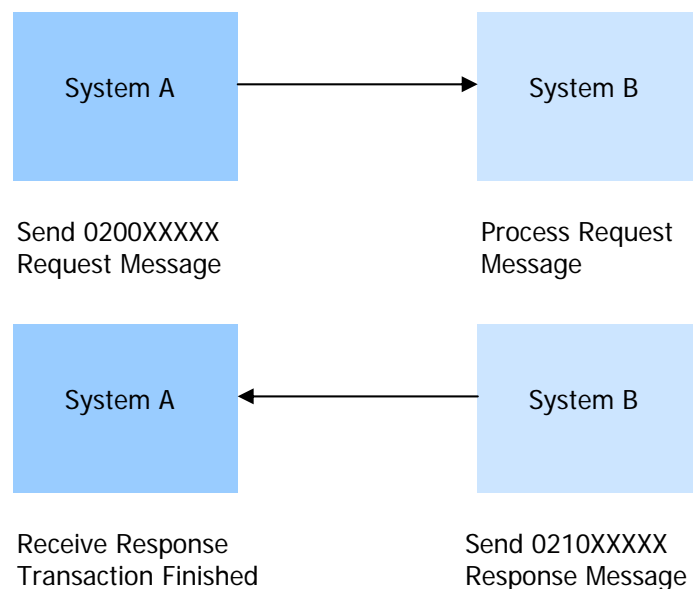Send 0210XXXXX
Response Message

Figure 1 – Normal Transaction Message Flow

Financial transaction message can be either monetary or non-monetary. Non-monetary message are messages that does inquiries to the remote system and other non-monetary transactions. Monetary transactions messages are messages that request the remote system to credit or debit a certain amount into an account.

System A

System B

Send 0400XXXXX
Reversal Request Message

Process Reversal
Request Message

System A

System B

Receive Response
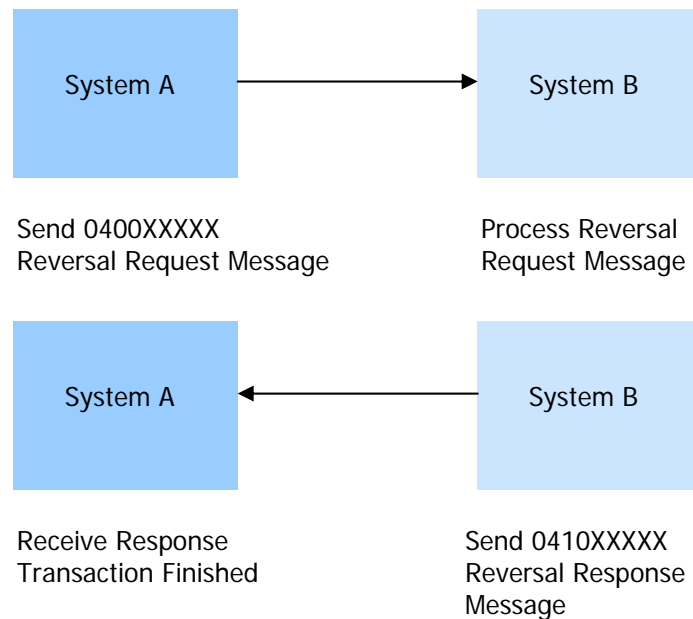Transaction Finished

Send 0410XXXXX
Reversal Response
Message

Figure 2 – Normal Reversal Message Flow

A reversal message is identified by the header of 04XX. For interactive reversal transaction, the identifier is 0400 message and the remote host will response the requester with a 0410 message. However for non-interactive reversal transaction, the identifier would be 0420 message and would be responded with a 0430 message.

An example when a reversal message is being sent out is when a previous successful financial transaction (02XX) is being voided at credit card terminals. Reversal messages are also being sent out automatically when the requester does not receive a response in a certain time frame (time out situation). This kind of reversal message is being termed as auto-reversal messages. When a reversal message does not receive a response in time (transaction timed out), the requester will repeat sending the previous reversal message, and this is called repeat reversal messages. Repeat reversal messages have an identifier of 0401 for interactive transactions and 0421 for non-interactive transactions.

The next Message Type Identifier that we will look into is the 0800 messages or Network Management Messages. This type of message is being sent to control the interchange network by supporting or describing system condition or system security. Common messages for system condition are for instance sign on and sign off messages. Other common messages are cut off and echo messages.

Bit map

Bit map(s) follows the Message Type Identifier. A single bit map consists of sixty-four (64) bits or sixteen (16) hexadecimal characters positioned from left to right. Each bit denotes the presence or absence of the corresponding data element.

Two bit maps can exist on an ISO8583 message. However the primary bit map must always be present. The primary bit map signifies the presence of data elements 1 to 64 and the secondary bit map indicates the presence of data elements 65 to 128. Each data element represents a certain usage in the standard ISO8583 message. Most commonly used data elements are usually represented in the primary bit map.
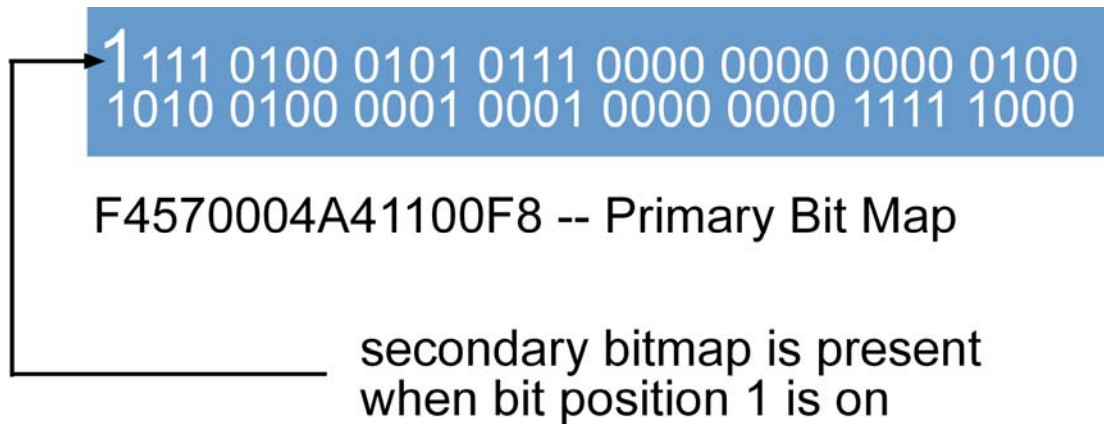
1111 0100 0101 0111 0000 0000 0000 0100
1010 0100 0001 0001 0000 0000 1111 1000

F4570004A41100F8

Hexadecimal Character	Bit map Represented
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

From the table above, we can see that the hexadecimal characters represent the bit map. When a bit is '1', the corresponding data element shall not be blank and when the bit is '0', the data element is off and shall be blank.

A bit is set on when it has a value of '1' and set off when it is '0'. The first bit of the primary bit map signifies if the secondary bit map is present. The figure above shows the presence of a secondary bit map. Bit 1 is on and therefore the secondary bit map exists in the ISO8583 message.

1111 0100 0101 0111 0000 0000 0000 0100
1010 0100 0001 0001 0000 0000 1111 1000

F4570004A41100F8 -- Primary Bit Map

secondary bitmap is present
when bit position 1 is on

0011 0101 0000 0000 0001 0001 1000 0000
1100 0000 0001 0000 0000 0000 0000 0000

35001180C0100000 -- Secondary Bit Map

Data Elements

There are 128 bit map data elements defined in the ISO8583 standard. Here as an introduction, the most common fields are be described. The data elements are the essence of the whole ISO message, information regarding the transaction is carried in these fields. Fields are either defined with a constant length or variable length. LLVAR and LLLVAR mean the length of the variable that follow. For instance, LLVAR means the length of the field can be from 00 to 99. LLLVAR means the length can be up to 999.

Bit#	Description	Format	Attribute
2	Primary Account Number	LLVAR	n..19
3	Processing Code		n-6
4	Amount Transaction		n-12
7	Transaction Date and Time	MMDDhhmmss	n-10
11	System Trace Audit Number		n-6
12	Time, Local Transaction	hhmmss	n-6
13	Date, Local Transaction	MMDD	n-4
32	Acquiring Institution Identification Code	LLVAR	n..11
39	Response Code		an-2
48	Additional Data - Private	LLLVAR	ans...999
49	Currency Code		n-3
90	Original Data Elements		n-42

Example ISO Messages

This is an example ISO network management message.
0800823A0000000000000040000000000000004200906139000010906130420042 0001

This is an example ISO network management message response.
0810823A00000200000004800000000000000042009061390000109061304200420 000010 31128

This is an example ISO financial transaction message.
0200323A40010841801038000000000000000004200508050113921208050420042 2513207200000100000011 56040800411   012511 46333156336000299

This is an example ISO financial transaction message response.
0210323A40010A4180103800000000000000000420050805011392120805042004225132072 00000010000001156040008 00411   163011511463331563GBAAASDD   ERRR 1300101B5439100100001765435000000000090300000268410000000300000000000000898 100009431000000000000000000 000000000000000036000299

This is an example ISO reversal message.
0400F23A400108418202000000400000000019111111111000000000018000000000000300000 90806465100331613451909080909601006000200000000000003430003948 03808110012000004096565733200000003000001360030003317000394809080640651000000 000313202000033160908064519000000002000000000000

This is an example ISO reversal message response.
0410F23A40010A4182020000004000000000191111111110000000000180000000000003000009 0908064651003316134519090809086010060002000000000000343000003948 03808110012000006281100120000040965657332360030003317000394809080640651000000 000313202000033160908064519000000002000000000000

This is an example ISO reversal repeat message.
0401F23A400108418202000000400000000019111111111000000000018000000000000300000 90806465200331613451909080909601006000200000000000003430003948 0380811001200000409656573320000000300000136003000331800039480908064520000000 000313202000033160908064519000000002000000000000

This is an example ISO reversal repeat message response.
0410F23A40010A4182020000004000000000191111111110000000000180000000000003000009 0908064652003316134519090809086010060002000000000000343940003948 0380811001200000409656573320000000300000136003000331800039480908064520000000 000313202000033160908064519000000002000000000000