

TECHNICAL DOCUMENT

REAL TIME DATA

SECURITIES LENDING AND BORROWING (SLB) MARKET (LEVEL 2)

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REAL TIME DATA TECHNICAL SPECIFICATION

SLB MARKET

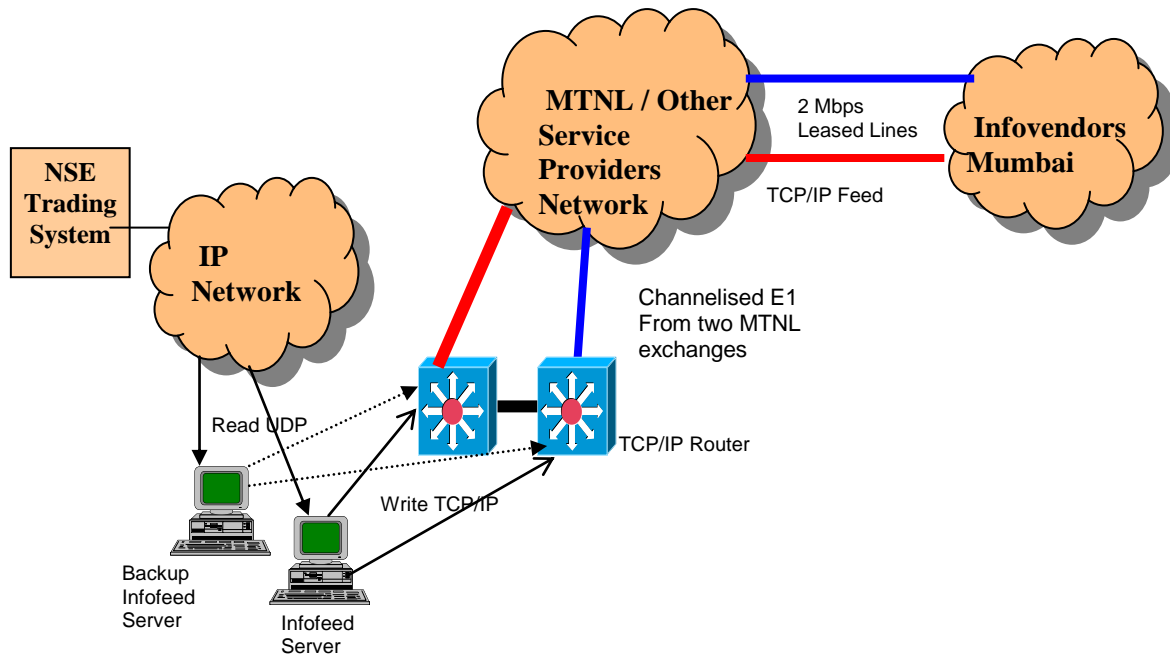
1. INTRODUCTION

DotEx International Ltd. disseminates NSEIL's (National Stock Exchange of India Ltd.) real time broadcast data to various information agencies. It provides the 3 different types of data to vendors, i.e. Real Time Data, Snapshot Data and End of Day Data. The real time data is a packet broadcast available in TCP/IP format, where as the snapshot data and End of day data is available in the form of files. The Infofeed server provides NSEIL real time broadcast data. The information agencies connect to the Infofeed Server through 2Mbps Leased Lines. These leased lines are terminated on Infofeed Router and their data specific pneumatic calls are forwarded to Infofeed server. The Infofeed server accepts these pneumatic calls and creates a socket connection. The TCP/IP data flows to the information agencies through these socket connections.

2. CONNECTION DETAILS

Structural Diagram

The structural diagram of Real Time data connection has been explained below -



Online Requirements

- A Router / Switch or a card with TCP/IP capabilities to connect to 256 Mbps transmission lines for receiving NSEIL's Real time information.
- The Information agency should develop applications that initiate TCP/IP calls through 2 Mbps Leased Line.

Steps for Authentication AND Receiving feed

- a) Client applications at vendor end, establish the connection with Infofeed Server application using specified IP address and Port.
- b) After establishing the connection, client application sends the login packet to Infofeed server application.

Packet format of Login packet (LOGIN_REQ) is as follows,

```
struct LOGIN_REQ
{
    struct INFO_HEADER sHeader;
    struct LOGIN_REQ_DATA sData;
    struct INFO_TRAILER sTrailer;
};
struct LOGIN_REQ_DATA {
    char cUserId[10];
    char cPassword[8];
    char cNewPassword[8];
    char cConfmPassword[8];
};
struct INFO_HEADER
{
    short iCode;
    short iLen;
    LONG ISeqNo;
};
struct INFO_TRAILER
{
    short iChecksum;
    CHAR cEOT;
};
```

- c) Password field is case sensitive, password should be minimum 6 characters long, password and user id should not be same, password should start with alphabet and password should be alphanumeric (No wild characters are allowed).
- d) If user wants to change his password then the user needs to specify new password & confirm password (Both fields should match) otherwise leave it blank.
- e) Based on the above information, user will get Log on response (LOGIN_RESPONSE) from Infofeed Server.

```
struct LOGIN_RESPONSE
{
    struct COM_HEADER sCOMHeader;
    struct LOGIN_RESPONSE_DETAIL sDetail;
```

```

};
struct LOGIN_RESPONSE_DETAIL
{
    struct INFO_HEADER sHeader;
    struct LOGIN_RESPONSE_DATA sData;
    struct INFO_TRAILER sTrailer;
};
struct COM_HEADER
{
    char cCmopOrNot;
    short iPackLen;
    short iNoOfPack;
};
struct INFO_HEADER
{
    short iCode;
    short iLen;
    LONG lSeqNo;
};
struct INFO_TRAILER
{
    short iChecksum;
    CHAR cEOT;
};
struct LOGIN_RESPONSE_DATA
{
    long iErrCode;
    char cMesg[50];
};
};

```

Following Error code will be returned which client needs to interpret as:-

1000- Successful

1001- Password Update Successfully

1002- Wrong UserId-Password Combination

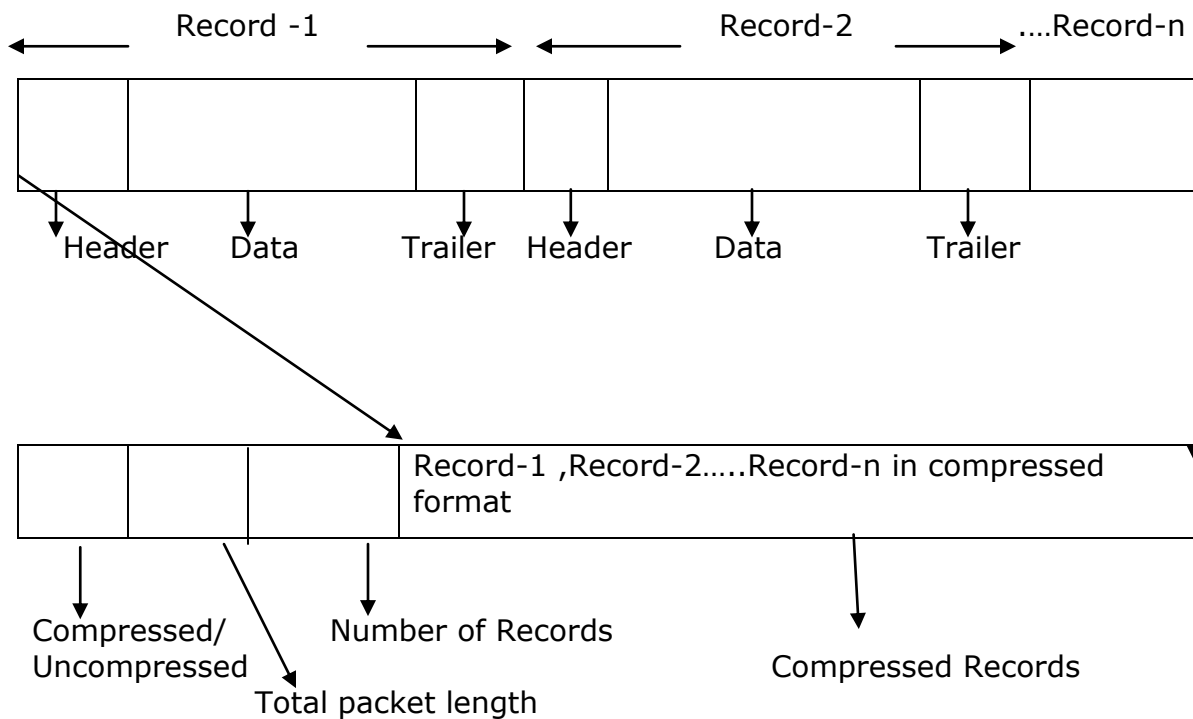
1003- Password is not valid in password change request.

1004- Login request is not correct.

Error code other than above - Error in receiving logon response

- f) After successful login, Infofeed Application starts sending packets in the below format.

Packet Format:



Compressed/Uncompressed: This field tells whether packet is compressed or not compressed.

If this Field = 0 then Compressed.

Field = 1 then Uncompressed.

Number of Records: This field tells the number of records present in the compressed packets.

Packet length: this field specifies the total packet length.

```
Structure COM_HEADER
{
    char cCmpOrNot;
    short iPackLen;
    short iNoOfPack;
};
```

g) As the data packets are sent in compressed format there is a need to decompress them. The compression algorithm used is LZ0.

h) The Decompression algorithm used should be LZ0

Steps for Decompressing feed

- LZO Algorithm Details:

- a) LZO is a data compression library which is suitable for data de-/compression in real-time. This means it favors speed over compression ratio.
- b) LZO is written in ANSI C. Both the source code and the compressed data format are designed to be portable across platforms.

LZO implements a number of algorithms with the following feature

- Decompression is simple and **very** fast.
- Requires no memory for decompression.
- Compression is pretty fast.
- Requires 64 KB of memory for compression.
- Allows you to dial up extra compression at a speed cost in the Compressor.
- The speed of the decompressor is not reduced.
- Includes compression levels for generating pre-compressed data which achieve a quite competitive compression ratio.
- There is also a compression level which needs only 8 KB for Compression.
- Algorithm is thread safe.
- Algorithm is lossless.

LZO supports overlapping compression and in-place decompression.

- c) Files required for LZO algorithm.

- Include files, source files (src) provided by LZO
- LZO.lib

For more information on LZO library and downloads visit:

http://www.nseindia.com/content/press/prs_whatsnew.htm#2

Specifications for utilizing on-line broadcast information

- **Decompression steps:**

- a) Receive the packet in the temporary buffer i.e. array of characters.
- b) First field will identify whether the packet is compressed or not.
- c) If this field is **0** then Decompress it using LZO algorithm else if **1** **don't** decompress it and proceed in normal way as it is being done today.
- d) The second field is packet length.
- e) The third field contains the number of records in the packet.
- f) If compressed use following function of LZO to Decompress.

```
r = lzo1z_decompress ((unsigned char *) cInputBuf, ipLength,  
(unsigned char*) cOutputBuf, opLength, NULL);
```

lzo1z_decompress: Function which decompresses the data packet receive

CInputBuf: Input buffer in which compressed data is received

IpLength: The length of the packet which application has received using Receive ().

COutputBuf: The uncompressed output data which is result of decompression.

OpLength: Length of uncompressed data

- g) After decompression data will be available in Output Buffer.
- h) Map the outputbuf to existing Header structure according to **SN** or **SX**.
- i) Look for Record size in the length field and Code (i.e. SN or SX).
- j) Steps to recover data from OutputBuf.

Algorithm:

```
Length_of_Record = Header->length;  
Sequence_no = Header->Sequence_num;  
For I = 0 to Number of records (obtained in step 4)  
Begin  
    Bytes_to_seek = Length_of_Record * I  
    Seek to number of Bytes_to_seek  
    Map (Length_of_Record) of bytes to proper structure according  
    to iCode (SN or SX) as found in Header part.  
    Do the required processing....  
    ....  
End  
End for Loop.
```

3. DATA DETAILS

The real time data is disseminated in the form of TCP/IP packets and each single packet generated by Infofeed system with a definite structure i.e. Header, Data body and Trailer.

THE HEADER

The header in turn consists of 3 fields – Code, Length and Sequence number. The details of these fields are explained as below.

Code – It is a 2-Char field that provides the information about the type of packet or the type of data that each packet contains. The NSEIL real time data contains various types of packets that may or may not have data part. Each packet can be differentiated with the code filed. The various types of packets disseminated as real time data feed are - Heartbeat Signal (SH), Login Request (SQ), Login Response (SR), Market Open (SO), Market Close (SC), New Update (SN), Security Addition (SA) and Modification (SM), End of day Market Status (SS), End of Feed (SE), Security Information (ST) etc.

Length – It is a 2-byte hexadecimal field that provides the length of record within the each packet of NSEIL real time data. This includes the length of Header, Data, Trailer and the Carriage return.

Sequence Number – It is a 4-byte ASCII field that provides the sequence number of each packet that is disseminated in NSEIL real time data. The very first packet sequence number is initiated with number 1 (One) for a each market and each successive packet is incremented by one thereafter.

DATA BODY:

The following information is provided in data block -

- a. Market Open
- b. Market Close
- c. Trade and Order information
- d. Broadcast Messages
- e. Descriptor Addition, Modification and Deletion
- f. Market Status at the end of the day
- g. End of the feed
- h. Heart Beat Signal
- i. Security Information

TRAILER

The trailer is a two-byte checksum. A CR will terminate the block of data.

4. DATA STRUCTURE DETAILS

4.1 LOGIN REQUEST (send by client application)

Login Request packet will be send by the client application for login into the Infofeed application. If user wants to change his password he will specify the new password and confirm password field. Password is case sensitive. Format of this packet is as follows.

INFO HEADER:

- | | |
|--------------------|-------------------------|
| a) Code | 'SQ' |
| b) Length | Short Integer (2 Bytes) |
| c) Sequence Number | 00 |

ASCII DATA:

- | | |
|---------------------|----------|
| d) User Id | 10 Chars |
| e) Password | 8 Chars |
| f) New Password | 8 Chars |
| g) Confirm Password | 8 Chars |

INFO TRAILER:

The Trailer is a 2-byte checksum. A CR will terminate the block of data.

4.2 LOGON RESPONSE (send by Infofeed application)

Logon response packet will be send by the Infofeed server application after receiving the Login Request packet from the client application.

COM HEADER:

- | | |
|----------------------|-------------------------|
| a) Compressed or Not | 1 Char |
| b) Packet Length | Short Integer (2 Bytes) |
| c) No of Packets | Short Integer (2 Bytes) |

INFO HEADER:

- | | |
|--------------------|-------------------------|
| a) Code | 'SR' |
| b) Length | Short Integer (2 Bytes) |
| c) Sequence Number | Long (4 Bytes) |

ASCII DATA:

- | | |
|---------------|----------------|
| a) Error Code | Long (4 Bytes) |
| b) Message | 50 Chars |

INFO TRAILER:

The Trailer is a 2-byte checksum. A CR will terminate the block of data.

4.3 MARKET OPEN

The Market Open message is received whenever any particular market opens for the day. Market Open message will be received separately for different markets.

HEADER:

a) Code	'SO'
b) Length	0x0C
c) Sequence Number	XXXX

ASCII DATA:

The format of the ASCII data sent is as follows:

FIELD TYPE	FIELD WIDTH
1) Market Type	1 Char ('N'-Normal, 'A'-Auction, 'L'-All Markets)

TRAILER:

Checksum is not computed.

4.4 MARKET CLOSE

The Market Close message will be received whenever any particular market closes for the day. Market Close message will be received separately for different markets.

HEADER:

a) Code	'SC'
b) Length	0x0C
c) Sequence Number	XXXX

ASCII DATA:

The format of the ASCII data sent is as follows:

FIELD TYPE	FIELD WIDTH
1) Market Type	1 Char ('N'-Normal, 'A'-Auction, 'L'-All Markets)

TRAILER:

Checksum is not computed.

4.5 NEW UPDATE

These packets will be received only during the trading period of the particular markets and signify the trades occurring in that market. The Online Index field in this packet will be always zero.

HEADER:

a) Code	'SN'
b) Length	0x18D
c) Sequence Number	XXXX

ASCII DATA:

The format of the ASCII data sent is as follows:

FIELD TYPE	FIELD WIDTH
1) Symbol	10 Chars
2) Series	2 Chars
3) Market Type	1 Char ('N'-Normal, 'A'-Auction)
4) Best Buy-Order Price1	10 Chars
5) Best Buy-Order Quantity1	12 Chars
6) Best Buy-Order Price2	10 Chars
7) Best Buy-Order Quantity2	12 Chars
8) Best Buy-Order Price3	10 Chars
9) Best Buy-Order Quantity3	12 Chars
10)Best Buy-Order Price4	10 Chars
11)Best Buy-Order Quantity4	12 Chars
12)Best Buy-Order Price5	10 Chars
13)Best Buy-Order Quantity5	12 Chars
14)Best Sell-Order Price1	10 Chars
15)Best Sell-Order Quantity1	12 Chars
16)Best Sell-Order Price2	10 Chars
17)Best Sell-Order Quantity2	12 Chars
18)Best Sell-Order Price3	10 Chars
19)Best Sell-Order Quantity3	12 Chars
20)Best Sell-Order Price4	10 Chars
21)Best Sell-Order Quantity4	12 Chars
22)Best Sell-Order Price5	10 Chars
23)Best Sell-Order Quantity5	12 Chars
24)Last Traded Price	10 Chars
25)Last Traded Quantity	12 Chars
26)Total Traded Quantity	12 Chars
27)Security Status	1 Char (Suspended (S) or Blank)
28)Opening Price	10 Chars
29)High Price	10 Chars
30)Low Price	10 Chars
31)Close Price	10 Chars
32)Average Traded Price	10 Chars

33) Total Buy Quantity	12 Chars
34) Total Sell Quantity	12 Chars
35) Total Turnover	25 Chars
36) Online Index	8 Chars (Value will be always zero)
37) Settlement Date	11 Chars (Format DD-MON-YYYY)

TRAILER:

The Trailer is a 2-byte checksum. A CR will terminate the block of data.

4.6 BROADCAST MESSAGE

These packets consist of the messages broadcast during the Trading time containing information like changes in the price bands of particular scrips and market-related information.

HEADER:

a) Code	'SB'
b) Length	0xXX (Variable depending on the length of the Message string)
c) Sequence Number	XXXX

ASCII DATA:

The format of the ASCII data sent is as follows:

FIELD TYPE	FIELD WIDTH
1) Message Code	3 Chars (NSE or AUC)
2) Message Length	3 Chars
3) Message String	(Message Length) No. Of Chars

TRAILER:

The Trailer is a 2-byte checksum. A CR will terminate the block of data.

4.7 SECURITY DESCRIPTOR ADDITION / MODIFICATION / DELETION

This packet consists of information about addition, modification or deletion any of the Security (Descriptor). This is sent as a part of the End of the Day feed.

HEADER:

a) Code	'SA' or 'SM' or 'SD'
b) Length	0x76
c) Sequence Number	XXXX

ASCII DATA:

The format of the ASCII data sent is as follows:

FIELD TYPE	FIELD WIDTH
1) Symbol	10 Chars
2) Series	2 Chars
3) Security Description	30 Chars
4) Regular Lot	5 Chars
5) Market Type	1 Char ('N'- Normal, 'A'- Auction)
6) Tick Size	6 Chars
7) Face Value	9 Chars
8) Issue Capital	12 Chars
9) Market Index Participation	1 Char ('Y'-Yes, 'N' -No)
10) Last Update Date & Time	20 Chars (Format: DD-MON-YYYY HH: MM: SS)
11) Settlement Date	11 Chars (Format DD-MON-YYYY)

TRAILER:

The Trailer is a 2-byte checksum. A CR will terminate the block of data.

4.8 END OF THE DAY MARKET STATUS

At the end of the day, market status will be sent for all the descriptors in the system.

HEADER:

a) Code	'SS'
b) Length	0x84
c) Sequence Number	XXXX

ASCII DATA:

The format of the ASCII data sent is as follows:

FIELD TYPE	FIELD WIDTH
1) Symbol	10 Chars
2) Series	2 Chars
3) Market Type	1 Char ('N'-Normal, 'A'-Auction)
4) Trade High Price	10 Chars
5) Trade Low Price	10 Chars
6) Opening Price	10 Chars
7) Closing Price	10 Chars
8) Last Traded Price	10 Chars
9) Previous Close Price	10 Chars
10) Total Traded Quantity	12 Chars
11) Total Traded Value	25 Chars
12) Settlement Date	11 Chars (Format : DD-MON-YYYY)

TRAILER:

The Trailer is a 2-byte checksum. A CR will terminate the block of data.

4.9 END OF THE FEED

This end of the packet indicates that all the parts of End of the Day feed have been completed.

HEADER:

- a) Code `SE`
- b) Length 0x0B
- c) Sequence Number XXXX

ASCII DATA:

Not associated with any ASCII data.

TRAILER:

Checksum is not computed.

4.10 HEARTBEAT SIGNAL

The Heartbeat packets are sent throughout the day from 8:00 a.m. to 08:30 p.m. This packet indicates to the Info-Vendors that data packets are received from the Infofeed server.

HEADER:

- a) Code `SH`
- b) Length 0x0B
- c) Sequence Number XXXX

ASCII DATA:

Not associated with any ASCII data.

TRAILER:

Checksum is not computed.

4.11 SECURITY INFORMATION

These packets are sent at the beginning of the each trading day by approximately **08:45 AM**. This feed contains the information about the securities valid in the CM Market for trading.

HEADER:

- a) Code `ST`
- b) Length 0x3B
- c) Sequence Number XXXX

ASCII DATA:

The format of the ASCII data sent is as follows:

FIELD TYPE	FIELD WIDTH
1) Token Number	10 Chars
2) Symbol	10 Chars
3) Series	2 Chars
4) ISIN Number	12 Chars
5) Is Deleted	1 Char
6) Settlement Date	11 Chars (DD-MON-YYYY)
7) Allow Recall	1 Char ('1' = Yes, '2' = No)
8) Allow Repay	1 Char ('1' = Yes, '2' = No)

TRAILER:

The Trailer is a 2-byte checksum. A CR will terminate the block of data.

5. CONTACT INFO

Name	Email	Contact Number
DOTEX Business	dotex@nse.co.in	91-22-26598385
Technical Support	infofeed_support@nse.co.in	-

6. NOTE

6.1 Normal Market

In the Pre-Open phase of the market, the Order Price can be 0.00. This indicates that the order placed is an At Open Order (ATO) and the actual Order Price will be calculated by the system when the market opens. Even though no trade takes place in the Pre-Open phase the Last Traded Price and the Open Price will change as the orders are placed in the system. The final open price for the security is calculated after Pre-Open period has ended. The Total Traded Quantity will be zero in the Pre-Open phase. In the Market Open phase also the Total Traded Quantity will be zero when orders are placed but no trades take place. The Last Traded Price will never be zero in the Normal Market.

6.2 Auction Market:

In the auction market the Open price and the Last Traded Price would be zero till the auction ends and the auction price is calculated by the system. Since Auction in any particular scrip is done at a fixed price the High Price, Low Price, Closing Price and Index values is zero for all scrips traded in the Auction Market.

The auction market timings are from 10:30 hrs to 11:00 hrs.

7. CHECKSUM

The **Checksum routine** followed for Info Vendor Feed is as follows:

```
// Following are the defines for checksum calculation
#define DC1      17
#define DC3      19
#define CR       13
#define LF       10
#define POLY     0x1021
// End of defines

unsigned check_sum (cData, iLength)
char *cData ;
int iLength;
{
    unsigned uAccum = 0;
    unsigned uData;
    unsigned char ucChk[2];
    int i,j;

    for (i=0;i<iLength;i++){
        uData = *(cData+i);
        uData <<= 8;
        for(j=8; j>0 ;j--){
            if((uData^uAccum)&0x8000)
                uAccum=(uAccum<<1)^POLY;
            /* SHIFT AND SUBTRACT POLY */
            else
                uAccum<<=1;
            uData<<=1;
        }
    }
    ucChk[0] = uAccum>>8;
    if (ucChk[0] == DC1 || ucChk[0] == DC3 || ucChk[0] == CR || ucChk[0]
    == LF )
        ucChk[0] -= 1;
    ucChk[1] = uAccum&0xFF;
    if (ucChk[1] == DC1 || ucChk[1] == DC3 || ucChk[1] == CR || ucChk[1]
    == LF )
        ucChk[1] -= 1;
    uAccum = ucChk[1];
    uAccum = (uAccum<<8) + ucChk[0];

    return(uAccum);
}
```

8. EXAMPLE: FUNCTION FOR DECOMPRESSION.

```
lzo_decomp (char cInputBuf [], unsigned int ipLength, char cOutputBuf [], unsigned
*opLength, unsigned short * lzo_errorcode)
{
    int r;
    Char mess [50];
    r = lzo1z_decompress ((unsigned char *) cInputBuf, ipLength,
(unsigned char *) cOutputBuf, opLength,
NULL);

    If ( r == LZO_E_OK)
    {
        Print (mess," Decompressed %lu bytes back into %lu bytes\n",
                (long) ipLength, (long) *opLength);

        Return true;
    }

    Else
    {
        OutputDebug ("Internal error - decompression failed");
        Return false;
    }
}
```