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PPP Stac LZS Compression Protocol

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Abstract

The Point-to-Point Protocol (PPP) [1] provides a standard method for transporting multi-protocol datagrams over point-to-point links.

The PPP Compression Control Protocol [2] provides a method to negotiate and utilize compression protocols over PPP encapsulated links.

This document describes the use of the Stac LZS data compression algorithm, with single or multiple compression histories, for compressing PPP encapsulated packets.

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1. Introduction

Starting with a sliding window compression history, similar to LZ1 [3], Stac Electronics developed a new, enhanced compression algorithm identified as Stac LZS. The LZS algorithm is optimized to compress all file types as efficiently as possible. Even string matches as short as two octets are effectively compressed.

The Stac LZS compression algorithm supports both single compression history communication and multiple compression history communication.

A single compression history will require the minimum amount of memory to implement, but may not provide as much compression as a multiple history implementation.

Often, many streams of information are interleaved over the same link. Each virtual link will transmit data that is independent of other virtual links. Using multiple compression histories can improve the compression ratio of a communication link by associating separate compression histories with separate virtual links of communication.

1.1. Licensing

Source and object licenses are available on a non-discriminatory basis. Hardware implementations are also available. Contact Stac Electronics at the address and phone number listed with the author's address for further information.

1.2. Specification of Requirements

In this document, several words are used to signify the requirements of the specification. These words are often capitalized.

MUST — This word, or the adjective "required", means that the definition is an absolute requirement of the specification.

MUST NOT — This phrase means that the definition is an absolute prohibition of the specification.

SHOULD — This word, or the adjective "recommended", means that there may exist valid reasons in particular circumstances to ignore this item, but the full implications MUST be understood and carefully weighed before choosing a different course.

MAY — This word, or the adjective "optional", means that this item is one of an allowed set of alternatives. An implementation which does not include this option MUST be prepared to interoperate with another implementation which does include the option.

2. LZS Packets

Before any LZS packets may be communicated, PPP must reach the Network-Layer Protocol phase.

When the Compression Control Protocol (CCP) has reached the Opened state, and LZS is negotiated as the primary compression algorithm, exactly one Stac LZS datagram is encapsulated in the PPP Information field, where the PPP Protocol field indicates type hex 00FD (compressed datagram) or type hex 00FB (Individual link compressed datagram). Type hex 00FD is used when compression is negotiated over a single physical link or when compression is negotiated over a single bundle consisting of multiple physical links. Type hex 00FB is used when compression is negotiated separately over individual physical links to the same destination. For more information, please refer to PPP Compression Control Protocol.

When CCP has not successfully reached the Opened state, or LZS is not the primary compression algorithm, exactly one LZS datagram is encapsulated in the PPP Information field, where the PPP Protocol field indicates type hex 4021 (Stac LZS).

> Note that in the latter case, use of LZS is terminated by the PPP LCP Protocol-Reject. The default format is used: a single history with no History Number field and no Check Value field (as if the

negotiated history count were 1).

The maximum length of the Stac LZS datagram transmitted over a PPP link is the same as the maximum length of the Information field of a PPP encapsulated packet.

Prior to compression, the uncompressed data begins with the PPP Protocol ID Field. Protocol-Field-Compression MAY be used on this value, if it has been successfully negotiated for the link.

The PPP Protocol ID Field is followed by the original Information field. The length of the uncompressed data field is limited only by the allowed size of the compressed data field and the higher protocol layers.

PPP Link Control Protocol packets MUST NOT be sent within Stac LZS packets. PPP Network Control Protocol packets MUST NOT be sent within Stac LZS packets.

2.1. Padding

The LZS Information field always ends with the last compressed data byte (also known as the <end marker>), which is used to disambiguate padding. This allows trailing bits as well as octets to be considered padding.

2.2 Zero Deletion/Insertion

When the sender does not add Padding [1], any trailing zero octets MAY be removed prior to transmission. A single trailing zero octet MUST be appended upon receipt, after removal of any framing FCS.

2.3. Reliability and Sequencing

When no Compression History is kept, the algorithm does not depend on a reliable link, and does not require that packets be delivered in sequence. However, per packet compression results in a lower compression ratio than it could be on a stream.

Some reasons for resetting the history on a per packet basis include:

- The link has a high error rate.
- The resources of the transmitter or receiver limit the ability to maintain a compression history between packets.

When more than 1 Compression History is negotiated, the packet sequence MUST be preserved within specific History Numbers. There is no sequence requirement between different History Numbers.

When one or more compression histories is negotiated on the link, the implementation MUST implement either a lower layer reliable link protocol, or keep the compressor and decompressor histories in synchronization, or both.

To maintain history synchronization, the implementation MUST use the Reset-Request and Reset-Ack messages of the Compression Control Protocol and MUST use an Option 17 check mode value of sequence numbers (and MAY implement other check mode values other than none). In this case the Data field of the CCP Reset-Request and Reset-Ack MUST contain the two octet History Number to be reset, most significant octet first.

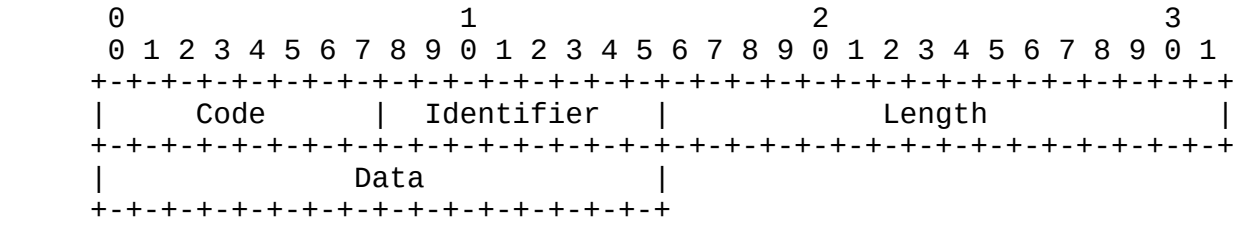
If neither of these conditions are met on the data link, then the compression histories MUST be reset after transmitting each datagram.

The transmitter MAY clear a Compression History at any time. The receiver is implicitly notified of this event, and the decompression history will automatically be affected.

The transmitter MUST reset a history after a CCP Reset-Request for the given History Number.

2.3.1 Reset-Request and Reset-Ack Packet Formats

A summary of the CCP Reset-Request and Reset-Ack packet formats for Stac LZS compressed links are shown below. The fields are transmitted from left to right.



Code

14 for Reset-Request;

15 for Reset-Ack.

Identifier

On transmission, the Identifier field MUST be changed whenever the content of the Data field changes, and whenever a valid reply has

been received for a previous request. For retransmissions, the Identifier MAY remain unchanged.

On reception, the Identifier field of the Reset-Request is copied into the Identifier field of the Reset-Ack packet.

Data

The Data field contains the two octet History Number of the compression history that is to be reset, most significant octet first. This History Number value is 1 when no history number is present.

2.4. Data Expansion

The maximum expansion of Stac LZS is 12.5%.

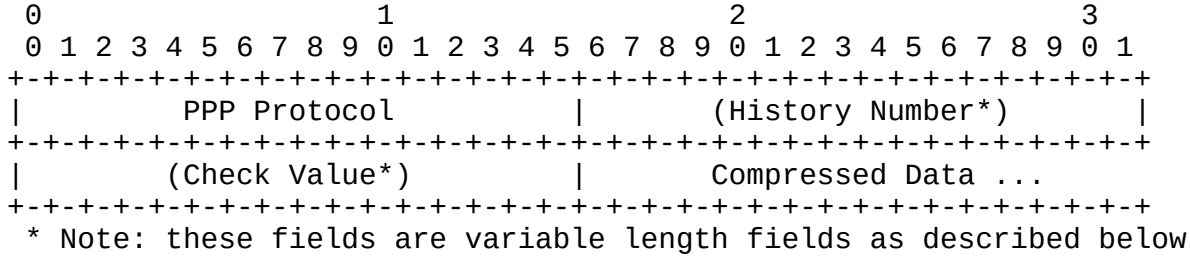
A Maximum Receive Unit (MRU) MAY be negotiated that is 12.5% larger than the size of a normal packet. Then, packets can always be sent compressed regardless of expansion.

When the expansion plus compression header exceeds the size of the peer's MRU for the link, the PPP packet MUST be sent without compression, in the original PPP packet form with the "native" PPP Protocol ID number. The transmitter MUST reset the affected history.

If it is detected that most packets are expanding (for example, due to the use of already compressed data), then the transmitter SHOULD stop sending compressed packets, and reset the appropriate history. Data compression MAY be resumed on this data link later.

2.5. Packet Format

A summary of the Stac LZS packet format is shown below. The fields are transmitted from left to right.



* Note: these fields are variable length fields as described below.

2.5.1. PPP Protocol

The PPP Protocol field is a 2 octet field described in the Point-to-Point Protocol Encapsulation [1].

When the Stac LZS compression protocol is successfully negotiated by the PPP Compression Control Protocol [2], the value is 00FD hex or 00FB hex as described in section 2. This value MAY be compressed when Protocol-Field-Compression is negotiated.

2.5.2. History Number

The history number field comprises 0, 1, or 2 octets.

The number of the compression history which was used, ranging from 2 to the negotiated History Count. By default a History Count of value 1 is supported and this field is not present.

If the negotiated History Count is less than 2, this field is removed. There is no need for the field when no history is kept, or only a single history is kept.

If the negotiated History Count is 2 or more, but less than 256,this field is 1 octet. If 256 or more histories are negotiated, this field is 2 octets, most significant octet first.

2.5.3. Check Value

The check value field comprises 0, 1, or 2 octets. By default, sequence number check is added to the packet (the field comprises 1 octet).

2.5.3.1. LCB

A simple one octet Longitudinal Check Byte (LCB) MAY be used, after successful negotiation of the LCB option. The LCB is the Exclusive-OR of FF(hex) and each octet of the uncompressed datagram (prior to the compression operation). On receipt, the receiver computes the Exclusive-OR of FF(hex) and each octet of the decompressed packet. If this value does not match the received LCB, then a receive failure for that history has occurred. The receive failure is handled according to the history synchronization procedure in section 2.5.4.

2.5.3.2. CRC

A two octet Cyclic Redundancy Check (CRC) MAY be used, instead of the LCB, after successful negotiation of the CRC option.

The transmitter MUST initialize the CRC value to FFFF(hex) at the beginning of each packet. The CRC computation is based on the HDLC FCS-16 polynomial:

x**16 + x**12 + x**5 + 1

The ones complement of the CRC is transmitted least significant octet first, which contains the coefficient of the highest term. On receipt, the receiver initializes the CRC to FFFF (hex), and computes the CRC based on the formula above for each octet of the decompressed packet. If the received CRC value does not match the transmitted CRC value, then a receive failure for that history has occurred. The receive failure is handled according to the history synchronization procedure in section 2.5.4.

2.5.3.3. Sequence Number

A one octet Sequence Number MAY be used, instead of a LCB or CRC, after successful negotiation of the Sequence Number option. After CCP has reached the open state, the transmitter MUST set the value of the sequence number field (the sequence number of the packet) to "1" and increment modulo 256 on successive packets that contain data fields. The sequence number is relative to the history number used.

After CCP has reached the open state, the receiver MUST set its internal reference value of the next expected sequence number (the sequence number of next packet to be received) to "1".

After a packet is received, the receiver MUST set the value of its internal reference value of the next expected sequence number for that history to the value of the sequence number field of the received packet plus 1 modulo 256.

If the sequence number of the received packet is not equal to the internal reference value of the expected sequence number for the same history, a receive failure for that history has occurred. The receiver MUST silently discard the out of order packet, and handle the failure according to the history synchronization procedure in section 2.5.4.

The sequence number MUST NOT be reset by the transmitter when a packet containing a Reset-Req is received. The receiver MUST always maintain its sequence number references for all supported histories.

2.5.3.3.1 History Synchronization with Sequence Numbers Example

```
Compressing Sender                Decompressing Receiver
....                              ....
send seq 101     ----------->     recv seq 101
                                  is 101 == 101?  Ok.
                                  forward packet for processing
                                  set internal reference to 102

send seq 102     ----------->     recv seq 102
                                  is 102 == 102?  Ok.
                                  forward packet for processing
                                  set internal reference to 103

send seq 103     ------X          (packet lost)

send seq 104     ----------->     recv seq 104
                                  is 104 == 103?  Send reset req!
                                  silently discard packet
                                  set internal reference to 105

(packet lost)        X-------     send reset request (ID=200)
                                  post-increment the identifier.

send seq 105     ----------->     recv seq 105
                                  is 105 == 105?  Ok.
                                  was reset ack received?  No!
                                  silently discard packet
                                  set internal reference to 106

                 <-----------     send reset request again(ID=200)
                                  (e.g. reset-ack time out)

send seq 106     ------X          (packet lost)

recv reset req   <-----------
(after line delay)
   (ID=200)

reset compression
   history
send reset ack   ----------->     recv reset ack (ID=200)
   (ID=200)

send seq 107     ----------->     recv seq 107
                                  is 107 == 106?  Send reset req!
                                  silently discard packet
                                  set internal reference to 108
```

```
recv reset req   <-----------     send reset request (ID=201)
   (ID=201)                       post-increment the identifier.

send seq 108     ----------->     recv seq 108
                                  is 108 == 108?  Ok.
                                  was reset ack received?  No!
                                  silently discard packet
                                  set internal reference to 109

send seq 109     ----------->     recv seq 109
                                  is 109 == 109?  Ok.
                                  was reset ack received?  No!
                                  silently discard packet
                                  set internal reference to 110

reset compression
   history
send reset ack   ----------->     recv reset ack (ID=201)
   (ID=201)

send seq 110     ----------->     recv seq 110
                                  is 110 == 110?  Ok.
                                  forward packet for processing
                                  set internal reference to 111

send seq 111     ----------->     recv seq 111
                                  is 111 == 111?  Ok.
                                  forward packet for processing
                                  set internal reference to 112
....                              ....
```

2.5.4. History Synchronization Procedure

On receipt, if Sequence Number one (1) follows any other number than zero (0), or is otherwise out of sequence, or the LCB or CRC is invalid, a CCP Reset-Request MUST be sent, containing the two octet History Number (most significant octet first, and which is the value 1 when no History Number is present), with a CCP Identifier. Identifiers are incremented on each occurrence of an out of sequence packet.

Upon receipt of the Reset-Request, the transmitter MUST reset the affected compression history, and transmit a CCP Reset-Ack packet with the Identifier field and data (history number) field set to the corresponding values of the Reset-Request. However, the Sequence Number (if implemented) is not reset.

For each packet that generates a receive failure, the receiver MUST increment the Identifier and transmit a CCP Reset-Request. For re-transmissions of existing receive failures, the Identifier MUST NOT be incremented.

After transmitting the Reset-Request packet, the receiver MUST continue silently discarding valid compressed packets for the corresponding history, until the correct CCP Reset-Ack Identifier (corresponding to the Reset-Request) for that History Number is received. Note that if sequence numbers are used, the receiver MUST process the sequence number of a received packet according to the procedures in section 2.5.4.

2.5.5. Compressed Data

The data field MUST contain only one datagram in compressed form. The length of this field is always an integer number of octets. There MUST BE only one end marker per block of compressed data.

The form of the data field is one block of compressed data as defined in 3.2 of X3.241-1994, and is repeated here for informational purposes ONLY.

```
<Compressed Stream> := [<Compressed String>] <End Marker>
<Compressed String> := 0 <Raw Byte> | 1 <Compressed Bytes>
<Raw Byte> := <b><b><b><b><b><b><b><b>          (8-bit byte)
<Compressed Bytes> := <Offset> <Length>

<Offset> := 1 <b><b><b><b><b><b><b> |           (7-bit offset)
            0 <b><b><b><b><b><b><b><b><b><b><b> (11-bit offset)
<End Marker> := 110000000

<b> := 1 | 0

<Length> :=
00        = 2     1111 0110      = 14
01        = 3     1111 0111      = 15
10        = 4     1111 1000      = 16
1100      = 5     1111 1001      = 17
1101      = 6     1111 1010      = 18
1110      = 7     1111 1011      = 19
1111 0000 = 8     1111 1100      = 20
1111 0001 = 9     1111 1101      = 21
1111 0010 = 10    1111 1110      = 22
1111 0011 = 11    1111 1111 0000 = 23
1111 0100 = 12    1111 1111 0001 = 24
1111 0101 = 13     ...
```

3. Sending Compressed Datagrams

The reliable and efficient transport of datagrams on the data link depends on the following processes.

3.1. Transmitter Process

When a network datagram is received, it is assigned to a particular history buffer and processed according to ANSI X3.241-1994 to form compressed data. Prior to the compression operation, if a Reset-Request is outstanding for the history buffer to be used or if the negotiated history count for this data link is 0, the history buffer is cleared.

Uncompressed data MUST be sent (in the original PPP packet form with the "native" PPP Protocol ID number) if compression causes enough expansion to cause the data compression datagram size to exceed the Information field's MRU. In this case, since the compressor has modified the history buffer before sending an uncompressed datagram, the history buffer MUST be cleared before the next datagram is processed.

The output of the compression operation is placed in the information field of the datagram. If the sequence number field is present according the value of the check mode field, the sequence number counter for the applicable history number MUST be incremented and its value placed in the sequence number field. If the LCB field is present according the value of the check mode field, the LCB value MUST be computed as specified in section 2.5.3.1. and the resultant value placed in the LCB field. If the CRC field is present according the value of the check mode field, the CRC value MUST be computed as specified in section 2.5.3.2. and the resultant value placed in the LCB field. Upon reception of a CCP Reset-Request packet, the transmitting compressor MUST be cleared to an initial state, which includes clearing the history buffer. In addition to the reset of the compressor, a CCP Reset-Ack packet MUST be transmitted. The data field of this packet MUST be filled with the corresponding two octet history number, most significant octet first.

3.2. Receiver Process

If a CCP Reset-Request packet is received, the local compression engine MUST be signaled that a Reset-Request has been received for the history number specified in the data field. If a CCP Reset-Ack packet is received, any outstanding receive failure for the specified history MUST be cleared. If no receive failure is outstanding, and the sequence number field is present, its value is checked. If a receive failure has occurred, it MUST be handled according to the

history resynchronization mechanism described below, and the remainder of the datagram is discarded.

If no receive failure is detected, the data is assigned to the indicated decompression history buffer and the compressed data block MUST be decompressed according to ANSI X3.241-1994. If the LCB or CRC fields are present on the received datagram, an LCB or CRC for the uncompressed data MUST be computed and checked against the received LCB or CRC according to sections 2.5.3.1. or 2.5.3.2., respectively. If a receive failure has occurred, it MUST be handled according to the History Resynchronization Mechanism described in section 3.4.

If a CCP Reset-Ack packet is received, the receiving decompressor's corresponding history MAY be reset to an initial state. (However, due to the characteristics of the Stac LZS algorithm, a decompressor history reset is not required). After reset, any compressed or uncompressed data contained in the packet is processed.

On the occurrence of a receive failure, an implementation MUST transmit a CCP Reset-Request packet with the data field containing the two octet history number (most significant octet first) matching the history that had the failure. Once a receive failure has occurred, the data in any subsequent packets received for that history MUST be discarded until a CCP Reset-Ack packet containing a valid Identifier matching the Identifier that was sent with the last CCP Reset-Request packet is received. It is the responsibility of the receiver to ensure the reliability of the Reset-Request/Ack mechanism. This may require the transmission of additional CCP Reset-Request packets before a CCP Reset-Ack packet is received.

3.3. History Maintenance

The History Count field determines the number of history buffers to be maintained for the compression protocol. For example, each history buffer could represent a separate logical connection between the data compression peers. When maintaining a history, the peers MUST use link error detection and signaling to ensure that both the compressor and decompressor copies of each history buffer are always identical.

Setting the History Count field to the value "0" indicates that the compression is to be on a connectionless basis. In this case, a single history buffer is used and MUST be cleared at the beginning of every datagram.

When the History Count field is set to the value "1", a single history buffer is maintained by each of the data compression peers.

(A single logical connection.)

When the History Count field is set to a value greater than "1", separate history buffers, error detection states, and signaling states are maintained by the decompressing entity for each history. The compressing peer may transmit data on any number of separate histories, up to the value of the History Count field.

3.4. History Resynchronization Mechanism

The Stac LZS protocol utilizes CCP Reset-Request/Reset-Ack mechanism in order to provide a mechanism for indicating a receiver failure in one direction of a compressed link without affecting traffic in the other direction. A receive failure is determined using the LCB, CRC, or sequence number mechanisms, according to the value of the check mode field.

Reset-Requests and Reset-Acks are specific to the history number of the packet containing them.

Reset-Request/Reset-Ack history synchronization signaling is provided to recover from a loss of synchronization between peers, especially in unreliable transport layers. As with all compression algorithms, the decompressor can not recover from dropped, erroneous, or mis-ordered datagrams, and will propagate errors catastrophically until both peers are reset to an initial state.

The Stac LZS protocol provides a means to detect these error conditions: LCB or CRC for erroneous datagrams, and sequence number for dropped or mis-ordered datagrams. There is a means for correcting a loss of synchronization: clear both the failing compression and decompression histories, and follow the transmitter and receiver processes in sections 3.1. and 3.2.

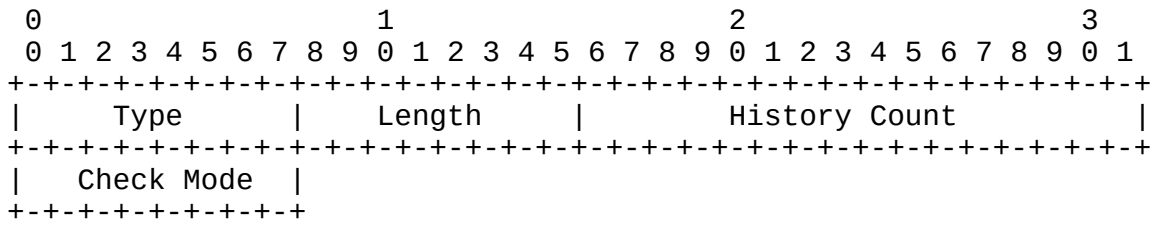
4. Configuration Option Format

Description

The CCP Stac LZS Configuration Option negotiates the use of Stac LZS on the link. By ultimate disagreement, no compression is used.

All implementations must support the default values.

A summary of the Stac LZS Configuration Option format is shown below. The fields are transmitted from left to right.



Type

17

Length

5

History Count

The History Count field is two octets, most significant octet first, and specifies the maximum number of Compression Histories.

The value 0 indicates that the implementation expects the peer to clear the Compression History at the beginning of every packet.

The value 1 is the default value, and is used to indicate that only one history is maintained.

Other valid values range from 2 to 65535. The peer is not required to send as many histories as the implementation indicates that it can accept. However, it should be noted that resources are allocated in each peer to support the number of negotiated histories in this field.

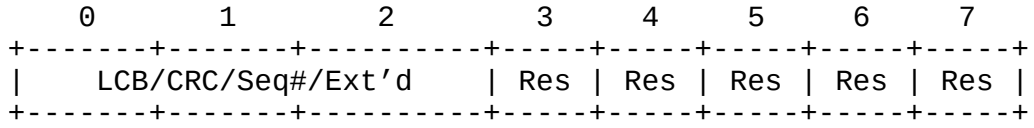
Check Mode

The Check Mode field indicates support of LCB, CRC or Sequence checking, and other future extensions to this standard. This field comprises 2 sub-fields, and is considered to be bit-mapped. The 3 least significant bits comprise 5 mutually exclusive values. The upper 5 bits are all "Reserved" bit locations must be set to "0" to allow for future backward-compatible extensions to this standard.

For compatibility, Sequence Numbers MUST be implemented; the other four check modes MAY be implemented.

Defined values:

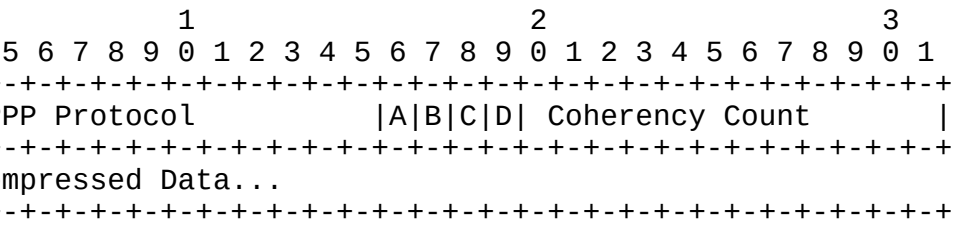
0	None	(MAY be implemented; however, MUST implement history count of zero)
1	LCB	(MAY be implemented)
2	CRC	(MAY be implemented)
3	Sequence Number	(MUST be implemented)
4	Extended Mode	(MAY be implemented)



5. Definition of Extended Mode

When Check Mode 4 (Extended Mode) is successfully negotiated, the packet format is different from the format described above. The Extended Mode format is described below. Extended Mode only supports a history count of 1.

5.1. Extended Mode Packet Format



PPP Protocol

The PPP Protocol field is described in the Point-to-Point Protocol Encapsulation [1].

When a compression protocol is successfully negotiated by the PPP Compression Control Protocol [2], the value is hex 00FD. Protocol-Field-Compression MUST NOT be used on this value when extended mode is negotiated on the link, even if Protocol-Field-Compression was successfully negotiated before data compression.

Bit A - PACKET_FLUSHED

This bit indicates that the history buffer has just been reset before this packet was generated. Thus, this packet can ALWAYS be decompressed because it is not based on any previous history. This bit is typically sent to inform the peer that it has reset its history buffer and that the peer can accept this packet and re-synchronize.

Bit B

This bit is not used with Stac LZS compression.

Bit C - PACKET_COMPRESSED

This bit is used to indicate that the packet is compressed. A value of 0 indicates uncompressed data, and a value of 1 indicates compressed data.

Bit D

This bit is not used with Stac LZS compression.

Coherency Count

The coherency count is used to assure that the packets are sent in proper order and that no packet has been dropped. This count is initialized to the value 0x000, and is always increased by 1 after each PPP packet is sent. When all bits are 1, the count returns to 0.

The coherency count is 12 bits so the decompressor must handle the rollover case.

Compressed Data

The compressed data begins with the protocol field. For example, an IP packet may contain 0021 followed by an IP header. The compressor will first try to compress the 0021 protocol field and then move on to the IP header.

Protocol-Field-Compression MUST NOT be used on this value when extended mode is negotiated on the link, even if Protocol-Field-Compression was successfully negotiated before data compression.

Zero deletion/insertion described in section 2.2 MUST NOT be performed when extended mode is negotiated.

5.2. Extended Mode Transmitter Process

When a network datagram is received, it is processed according to ANSI X3.241-1994 to form compressed data. If a CCP Reset-Request has been received from the decompressor, the compressor must clear its history buffer before sending the next packet.

Uncompressed data MUST be sent if the compression operation causes the compressed datagram to expand. In this case, since the compressor has modified the history buffer before sending an uncompressed datagram, the history buffer MUST be cleared before the next datagram is processed. The uncompressed data is placed in the information field of the datagram, and Bit-A MUST be set (indicating the history was cleared) and Bit-C MUST be clear (indicating uncompressed data) in the current packet's header. The value of the coherency counter is placed in the coherency count field and then the coherency counter is incremented.

If the compression operation does not cause the compressed datagram to expand and if a received Reset-Request is outstanding, then the output of the compression operation is placed in the information field of the datagram, and Bit-A MUST be set (indicating the history was cleared) and Bit-C MUST be set (indicating compressed data) in the current packet's header. The value of the coherency counter is placed in the coherency count field and then the coherency counter is incremented.

If the compression operation does not cause the compressed datagram to expand and there is not a Reset-Request outstanding, then the output of the compression operation is placed in the information field of the datagram, and Bit-A MUST be clear (indicating the history was not cleared) and Bit-C MUST be set (indicating compressed data) in the current packet's header. The value of the coherency counter is placed in the coherency count field and then the coherency counter is incremented.

Upon reception of a CCP Reset-Request packet, the transmitting compressor MUST be cleared to an initial state, which includes clearing the history buffer. In addition to the reset of the compressor, the PACKET_FLUSHED bit MUST be set in the header of the next transmitted data packet.

5.3. Extended Mode Receiver Process

When a data compression datagram is received from the peer, Bit-A and Bit-C MUST be checked. Prior to the decompression operation, if Bit-A is set, then the coherency count MUST be resynchronized to the received value in the coherency count field of the received packet,

and the receiving decompressor's corresponding history MAY be reset to an initial state. (However, due to the characteristics of the Stac LZS algorithm, a decompressor history reset is not required). After reset, any compressed or uncompressed data contained in the packet is processed, depending on the state of Bit-C.

Prior to the decompression operation, if Bit-C is clear (indicating uncompressed data), then the decompression history buffer must not be modified and the decompressor is not involved with deencapsulation. If Bit-C is set (indicating compressed data) then the received packet is decompressed according to ANSI X3.241-1994.

If the received packet is corrupt, then a Reset-Request is sent and this packet is discarded. If the received packet contains an incorrect coherency count, a Reset-Request is sent and this packet is discarded.

5.4. Extended Mode Synchronization

Packets may be lost during transfer. If the decompressor maintained coherency count does not match the coherency count received in the compressed packet or if the decompressor detects that a received packet is corrupted, the decompressor drops the packet and sends a CCP Reset-Request packet. The compressor on receiving this packet resets the history buffer and sets the PACKET_FLUSHED bit in the next frame it sends. The decompressor on receiving a packet with its PACKET_FLUSHED bit set, resets its history buffer and sets its coherency count to the one shipped by the compressor in that packet.

Thus synchronization is achieved without a Reset-Ack packet.

Security Considerations

Security issues are not discussed in this memo.

References

[1] Simpson, W., Editor, "The Point-to-Point Protocol (PPP)", STD 51, RFC 1661, Daydreamer, July 1994.

[2] Rand, D., "The PPP Compression Control Protocol (CCP)", RFC 1962, July 1996.

[3] Lempel, A. and Ziv, J., "A Universal Algorithm for Sequential Data Compression", IEEE Transactions On Information Theory, Vol. IT-23, No. 3, May 1977.

[4] Rand, D., "PPP Reliable Transmission", RFC 1663, Novell, July 1994.

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