                    PPP Gandalf FZA Compression Protocol

Status of this Memo

   This memo provides information for the Internet community. It does
   not specify an Internet standard. Distribution of this memo is
   unlimited.

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 Gandalf FZA data compression
   algorithm [3] for compressing PPP encapsulated packets.

Table of Contents

1. Introduction

    FZA is a high performance LZ [4] derivative that maximizes
    compression at the expense of memory and CPU. Compression
    performance can be adjusted based on CPU and memory available.

    Multiple PPP packets can be combined in a single compressed frame, or
    a single PPP packet can be spread across multiple frames.

1.1. Licensing

    Source and object licenses are available on a non-discriminatory
    basis for either a royalty or fixed price arrangement. Patent
    indemnity is included with the license.

2. FZA Packets

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

    When the Compression Control Protocol (CCP) has reached the Opened
    state, and FZA is negotiated as the primary compression algorithm,
    the PPP Protocol field indicates type hex 00FB (link compressed
    datagram), or type hex 00FD (compressed datagram).

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

    Padding

       The FZA packets require the negotiation of the Self-Describing-
       Padding Configuration Option [5] at LCP Link Establishment.

    Reliability and Sequencing

       The FZA algorithm expects a reliable link, as described in "PPP
       Reliable Transmission" [6].

       FZA expects the packets to be delivered in sequence.
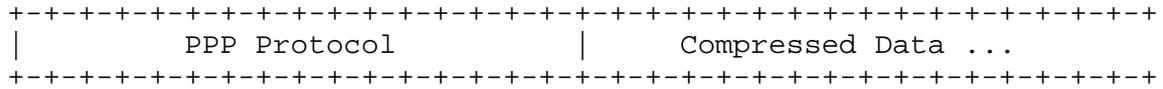
    Data Expansion

       The maximum expansion of Gandalf FZA is 2:1. However, typical
       expansion on pre-compressed data is 1.01:1. Expanded data is sent
       to maintain the integrity of the compression history.

       When the expansion exceeds the size of the peer's Maximum Receive
       Unit for the link, the expanded packet is sent in multiple PPP
       frames. The compressed data contains an indication of the end of
       the original packet.

2.1. Packet Format

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

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          PPP Protocol         |         Compressed Data ...
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

   PPP Protocol

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

      Type 00FD is used when the PPP multilink protocol is not used,
      and/or "inside" a multilink bundle. Type 00FB is used "outside"
      multilink, to compress independently on individual links of a
      multilink bundle. This value MAY be compressed when LCP
      Protocol-Field-Compression is negotiated.

   Compressed Data

      One or more octets. The compressed PPP encapsulated packet(s).

      Prior to compression, the uncompressed data begins with the
      original PPP Protocol number. This value MAY be compressed when
      LCP Protocol-Field-Compression is negotiated.

      The original Protocol number is followed by the original
      Information field. The length of the original Information field
      before compression MUST NOT exceed the link Maximum Receive Unit
      (MRU).

      PPP Link Control Protocol packets MUST NOT be sent within
      compressed data.

3. Configuration Option Format

    Description

       The CCP Gandalf-FZA Configuration Option negotiates the use of
       Gandalf FZA on the link. By default or ultimate disagreement, no
       compression is used.

    A summary of the Gandalf-FZA Configuration Option format is shown
    below. The fields are transmitted from left to right.

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     Type      |    Length     |   History    |  Version ...
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

    Type

       19

    Length

       >= 3

    History

       One octet. The History field specifies the maximum size of the
       compression history in powers of 2. Valid values range from 12 to
       15.

       The peer is not required to send as many histories as the
       implementation indicates that it can accept.

    Version

       Zero or more octets of additional configuration information. Any
       implementation that does not implement this information MUST send
       a Configure-Nak without this field.

       The Version field is not present for FZA.

       The Version field is a single octet containing the value 1 for
       FZA+.

Security Considerations

    Security issues are not discussed in this memo.

Acknowledgements

    FZA was developed by David Carr while at Gandalf Data Limited.

    FZA+ was an improvement by Abbie Barbir.

    Editing and formatting by William Simpson.

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, Novell, June 1996.

    [3]   Barbir, A., "A New Fast Approximate Arithmetic Coder",
           Proceedings of IEEE 28th SouthEastern Symposium on Systems
           Theory (SSST), Baton Rouge, Louisiana, pages 482-486, April
           1996.

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

    [5]   Simpson, W., Editor, "PPP LCP Extensions", RFC 1570,
           DayDreamer, January 1994.

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

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