                          PPP over SONET/SDH

Status of this Memo

   This document specifies an Internet standards track protocol for the
   Internet community, and requests discussion and suggestions for
   improvements. Please refer to the current edition of the "Internet
   Official Protocol Standards" (STD 1) for the standardization state
   and status of this protocol. 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.
   This document describes the use of PPP over Synchronous Optical
   Network (SONET) and Synchronous Digital Heirarchy (SDH) circuits.

   This document is the product of the Point-to-Point Protocol Working
   Group of the Internet Engineering Task Force (IETF). Comments should
   be submitted to the ietf-ppp@merit.edu mailing list.

Applicability

   This specification is intended for those implementations which desire
   to use the PPP encapsulation over high speed private point-to-point
   links, such as intra-campus single-mode fiber which may already be
   installed and unused. Because the PPP encapsulation has relatively
   low overhead, it is anticipated that significantly higher throughput
   can be attained compared to other SONET/SDH payload mappings, at a
   significantly lower cost for line termination equipment.

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1. Introduction

   PPP was designed as a standard method of communicating over point-
   to-point links. Initial deployment has been over short local lines,
   leased lines, and plain-old-telephone-service (POTS) using modems.
   As new packet services and higher speed lines are introduced, PPP is
   easily deployed in these environments as well.

   This specification is primarily concerned with the use of the PPP
   encapsulation over SONET/SDH links. Since SONET/SDH is by definition
   a point-to-point circuit, PPP is well suited to use over these links.

   The Synchronous Optical Network (SONET) [3] is an octet-synchronous
   multiplex scheme that defines a family of standard rates and formats.
   Despite the name, it is not limited to optical links. Electrical
   specifications have been defined for single-mode fiber, multi-mode
   fiber, and CATV 75 ohm coaxial cable. The transmission rates are
   integral multiples of 51.840 Mbps, which may be used to carry T3/E3
   bit-synchronous signals. The allowed multiples are currently
   specified as

             STS-1   51.840   STS-18   933.120
             STS-3   155.520   STS-24   1,244.160
             STS-9   466.560   STS-36   1,866.240
             STS-12 622.080   STS-48   2,488.320

   The CCITT Synchronous Digital Heirarchy (SDH) defines a subset of
   SONET transmission rates beginning at 155.520 Mbps [5].

             SONET   SDH equivalent
             STS-3c   STM-1
             STS-12c   STM-4
             STS-48c   STM-16

2. Physical Layer Requirements

   PPP treats SONET/SDH transport as octet oriented synchronous links.
   SONET/SDH links are full-duplex by definition.

   Interface Format

      PPP presents an octet interface to the physical layer. There is
      no provision for sub-octets to be supplied or accepted.

The octet stream is mapped into the SONET/SDH Synchronous Payload
Envelope (SPE), with the octet boundaries aligned with the SPE
octet boundaries.

No scrambling is needed during insertion into the SPE.

The Path Signal Label (C2) is intended to indicate the contents of
the SPE. The experimental value of 207 (cf hex) is used to
indicate PPP.

The Multiframe Indicator (H4) is currently unused, and MUST be
zero.

Transmission Rate

The basic rate for PPP over SONET/SDH is that of STS-3c/STM-1 at
155.520 Mbps. The available information bandwidth is 149.760
Mbps, which is the STS-3c/STM-1 SPE with section, line and path
overhead removed. This is the same super-rate mapping that is
used for ATM and FDDI [4].

Lower signal rates MUST use the Virtual Tributary (VT) mechanism
of SONET/SDH. This maps existing signals up to T3/E3 rates
asynchronously into the SPE, or uses available clocks for bit-
synchronous and byte-synchronous mapping.

Higher signal rates SHOULD conform to the SDH STM series, rather
than the SONET STS series, as equipment becomes available. The
STM series progresses in powers of 4 (instead of 3), and employs
fewer steps, which is likely to simplify multiplexing and
integration.

Control Signals

PPP does not require the use of control signals. When available,
using such signals can allow greater functionality and
performance. Implications are discussed in [2].

3. Framing

The framing for octet-synchronous links is described in "PPP in HDLC
Framing" [2].

The PPP frames are located by row within the SPE payload. Because
frames are variable in length, the frames are allowed to cross SPE
boundaries.

4. Configuration Details

    The standard LCP sync configuration defaults apply to SONET/SDH
    links.

    The following Configuration Options are recommended:

        Magic Number
        No Address and Control Field Compression
        No Protocol Field Compression
        32-bit FCS

Security Considerations

    Security issues are not discussed in this memo.

References

    [1]   Simpson, W., Editor, "The Point-to-Point Protocol (PPP)", RFC
           1548, Daydreamer, December 1993.

    [2]   Simpson, W., Editor, "PPP in HDLC Framing", RFC 1549,
           Daydreamer, December 1993.

    [3]   "American National Standard for Telecommunications - Digital
           Hierarchy - Optical Interface Rates and Formats Specification",
           ANSI T1.105-1991.

    [4]   "American National Standard for Telecommunications -
           Synchronous Optical Network (SONET) Payload Mappings", ANSI
           T1.105.02-1993 draft.

    [5]   CCITT Recommendation G.707, "Synchronous Digital Hierarchy Bit
           Rates", June 1992.

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Chair's Address

   The working group can be contacted via the current chair:

      Fred Baker
      Advanced Computer Communications
      315 Bollay Drive
      Santa Barbara, California 93117

      EMail: fbaker@acc.com

Author's Address

   Questions about this memo can also be directed to:

      William Allen Simpson
      Daydreamer
      Computer Systems Consulting Services
      1384 Fontaine
      Madison Heights, Michigan 48071

      EMail: Bill.Simpson@um.cc.umich.edu
             bsimpson@MorningStar.com