 Negotiation for IPv6 Datagram Compression Using IPv6 Control Protocol

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) provides a standard method of
   encapsulating network-layer protocol information over point-to-point
   links. PPP also defines an extensible Link Control Protocol, and
   proposes a family of Network Control Protocols (NCPs) for
   establishing and configuring different network-layer protocols.

   The IPv6 Control Protocol (IPV6CP), which is an NCP for a PPP link,
   allows for the negotiation of desirable parameters for an IPv6
   interface over PPP.

   This document defines the IPv6 datagram compression option that can
   be negotiated by a node on the link through the IPV6CP.

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1. Introduction

   PPP [1] has three main components:

      1) A method for encapsulating datagrams over serial links.

      2) A Link Control Protocol (LCP) for establishing, configuring,
         and testing the data-link connection.

      3) A family of Network Control Protocols (NCPs) for establishing
         and configuring different network-layer protocols.

   In order to establish communications over a point-to-point link, each
   end of the PPP link must first send LCP packets to configure and test
   the data link. After the link has been established and optional
   facilities have been negotiated as needed by the LCP, PPP must send
   NCP packets to choose and configure one or more network-layer
   protocols. Once each of the chosen network-layer protocols has been
   configured, datagrams from each network-layer protocol can be sent
   over the link. The link will remain configured for communications
   until explicit LCP or NCP packets close the link down, or until some
   external event occurs (power failure at the other end, carrier drop,
   etc.).

   In the IPv6 over PPP specification [2], the NCP, or IPV6CP, for
   establishing and configuring IPv6 over PPP is defined. The same
   specification defines the Interface Identifier parameter, which can
   be used to generate link-local and globally unique IPv6 addresses,
   for negotiation.

   In this specification, the compression parameter for use in IPv6
   datagram compression is defined. Together with RFC 5072 [2], this
   document obsoletes RFC 2472 [13]. However, no protocol changes have
   been introduced over RFC 2472.

1.1. Specification of Requirements

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

   The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT",
   "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this
   document are to be interpreted as described in [3].

2. IPV6CP Configuration Options

   IPV6CP Configuration Options allow negotiation of desirable IPv6
   parameters. IPV6CP uses the same Configuration Option format as
   defined for LCP [1] but with a separate set of Options. If a
   Configuration Option is not included in a Configure-Request packet,
   the default value for that Configuration Option is assumed.

   The only IPV6CP option defined in this document is the IPv6-
   Compression-Protocol. The Type field for this IPV6CP Option is as
   follows:

           2 IPv6-Compression-Protocol

   Note that the up-to-date values of the IPV6CP Option Type field are
   specified in the on-line database of "Assigned Numbers" maintained by
   IANA [7].

2.1. IPv6-Compression-Protocol

   This Configuration Option provides a way to negotiate the use of a
   specific IPv6 packet compression protocol. The IPv6-Compression-
   Protocol Configuration Option is used to indicate the ability to
   receive compressed packets. Each end of the link MUST separately
   request this option if bidirectional compression is desired. By
   default, compression is not enabled.

   IPv6 compression negotiated with this option is specific to IPv6
   datagrams and is not to be confused with compression resulting from a
   compression method negotiated via the PPP Compression Control
   Protocol (CCP) [12], which potentially affects all datagrams.

   A summary of the IPv6-Compression-Protocol Configuration Option
   format is shown below. The fields are transmitted from left to
   right.

```
    0                   1                   2                   3
    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |     Type      |    Length     |   IPv6-Compression-Protocol   |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |     Data ...
   +-+-+-+-+
```

      Type

         2

         Length

            >= 4

         IPv6-Compression-Protocol

            The IPv6-Compression-Protocol field is two octets and
            indicates the compression protocol desired. Values for this
            field are always the same as the PPP Data Link Layer Protocol
            field values for that same compression protocol.

            IPv6-Compression-Protocol field values have been assigned in
            [4, 5] for IP Header Compression (0061), and in [6] for Robust
            Header Compression (ROHC) (0003). Other assignments can be
            made in documents that define specific compression algorithms.

         Data

            The Data field is zero or more octets and contains additional
            data as determined by the particular compression protocol.

   The default (in the absence of negotiation of this option) is to have
   no IPv6 compression protocol enabled.

3. Security Considerations

   Lack of proper link security, such as authentication, prior to data
   transfers may enable man-in-the middle attacks resulting in the loss
   of data integrity and confidentiality. The mechanisms that are
   appropriate for ensuring PPP link security are addressed below
   together with the reference to a generic threat model.

   The mechanisms that are appropriate for ensuring PPP link security
   are: 1) Access Control Lists that apply filters on traffic received
   over the link for enforcing admission policy, 2) an authentication
   protocol that facilitates negotiations between peers [8] to select an
   authentication method (e.g., MD5 [9]) for validation of the peer, and
   3) an encryption control protocol that facilitates negotiations
   between peers to select encryption algorithms (or crypto-suites) to
   ensure data confidentiality [10]).

   There are certain threats associated with peer interactions on a PPP
   link even with one or more of the above security measures in place.
   For instance, using the MD5 authentication method [9] exposes one to
   replay attacks, in which an attacker could intercept and replay a
   station's identity and password hash to get access to a network. The
   user of this specification is advised to refer to [8], which presents
   a generic threat model, for an understanding of the threats posed to

the security of a link. The reference [8] also gives a framework to
specify requirements for the selection of an authentication method
for a given application.

4. IANA Considerations

No specific action is needed for the assignment of a value for the
Type field of IPv6 datagram compression option specified in this
specification. The current assignment is up-to-date in the registry
"PPP IPV6CP CONFIGURATION OPTIONS" for item IPv6-Compression-Protocol
(2) at [7]. However, the RFC reference for that item has been
changed to 5172.

No action is needed either for the assignment of the IPV6-
Compression-Protocol values, as such values have already been defined
by other documents listed in Section 2.1. Values for this field are
always the same as the PPP Data Link Layer Protocol field values for
that same compression protocol. As a result, future allocation of
these values is governed by RFC 3818 [11] that requires IETF
Consensus. Current values are in the registry "IPv6-Compression-
Protocol Types". However, the RFC reference for that registry has
been changed to 5172.

5. Management Considerations

From an operational point of view, the status of the negotiation and
the compression algorithm on the link should be observable by an
operator managing a network. There is no standard management
interface that covers this at the time of the writing of this
specification.

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7. References

7.1. Normative References

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   [6] Bormann, C., "Robust Header Compression (ROHC) over PPP", RFC
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7.2. Informative References

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