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# Point-to-Point Protocol (PPP) Vendor Protocol

## Status of this Memo



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## Abstract

The Point-to-Point Protocol (PPP) defines a Link Control Protocol (LCP) and a method for negotiating the use of multi-protocol traffic over point-to-point links. The PPP Vendor Extensions document adds vendor-specific general-purpose Configuration Option and Code numbers. This document extends these features to cover vendor-specific Network, Authentication, and Control Protocols.

## 1. Introduction

PPP's [1] Vendor Extensions [3] defines a general-purpose mechanism for the negotiation of various vendor-proprietary options and extensions to the kinds of control messages that may be sent via the Code field.

Some implementors may want to define proprietary network and control protocols in addition to the already-described features. While it would be possible for such an implementor to use the existing LCP Vendor-Specific Option to enable the use of the proprietary protocol, this staged negotiation (enable via LCP, then negotiate via some locally-assigned protocol number) suffers from at least three problems:

First, because it would be in LCP, the negotiation of the use of the protocol would begin before identification and authentication of the peer had been done. This complicates the security analysis of the feature and constrains the way in which the protocol might be deployed.

Second, where compulsory tunneling is in use, the system performing the initial LCP negotiation may be unrelated to the system that uses the proprietary protocol. In such a scenario, enabling the protocol at LCP time would require either LCP renegotiation or support of the proprietary protocol in the initial negotiator, both of which raise deployment problems.

Third, the fact that any protocol negotiated via such a mechanism would necessarily use a protocol number that is not assigned by IANA complicates matters for diagnostic tools used to monitor the datastream. Having a fixed number allows these tools to display such protocols in a reasonable, albeit limited, format.

A cleaner solution is thus to define a set of vendor-specific protocols, one in each of the four protocol number ranges defined by [1]. This specification reserves the following values:

| Value (in hex) | Protocol Name |
|---|---|
| 005b | Vendor-Specific Network Protocol (VSNP) |
| 405b | Vendor-Specific Protocol (VSP) |
| 805b | Vendor-Specific Network Control Protocol (VSNCP) |
| c05b | Vendor-Specific Authentication Protocol (VSAP) |

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 BCP 14, RFC 2119 [2].

## 2. PPP Vendor-Specific Network Control Protocol (VSNCP)

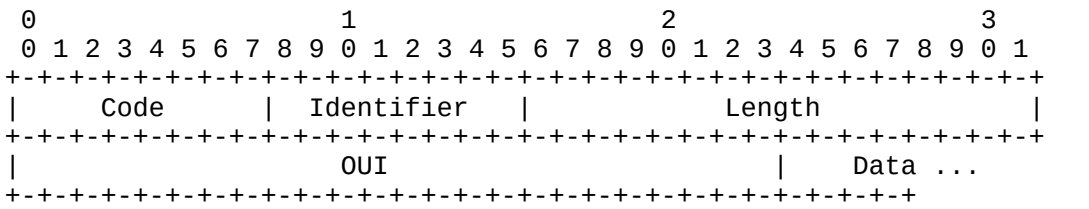
The Vendor-Specific Network Control Protocol (VSNCP) is responsible for negotiating the use of the Vendor-Specific Network Protocol (VSNP). VSNCP uses the same packet exchange and option negotiation mechanism as LCP, but with a different set of options.

VSNCP packets MUST NOT be exchanged until PPP has reached the Network-Layer Protocol phase. Any VSNCP packets received when not in that phase MUST be silently ignored. If a VSNCP packet with an unrecognized OUI is received, an LCP Protocol-Reject SHOULD be sent in response.

The network layer data, carried in VSNP packets, MUST NOT be sent unless VSNCP is in Opened state. If a VSNP packet is received when VSNCP is not in Opened state and LCP is Opened, the implementation MAY respond using LCP Protocol-Reject.

## 2.1. VSNCP Packet Format

Exactly one VSNCP packet is carried in the PPP Information field, with the PPP Protocol field set to hex 805b (VSNCP). A summary of the VSNCP packet format is shown below. The fields are transmitted from left to right.




Code

Only LCP Code values 1 through 7 (Configure-Request, Configure-Ack, Configure-Nak, Configure-Reject, Terminate-Request, Terminate-Ack, and Code-Reject) are used. All other codes SHOULD result in a VSNCP Code-Reject reply.

Identifier and Length

These are as documented for LCP.

OUI

This three-octet field contains the vendor’s Organizationally Unique Identifier. The bits within the octet are in canonical order, and the most significant octet is transmitted first. See Section 5 below for more information on OUI values.

Data

This field contains data in the same format as for the corresponding LCP Code numbers.

## 2.2. VSNP Packet Format

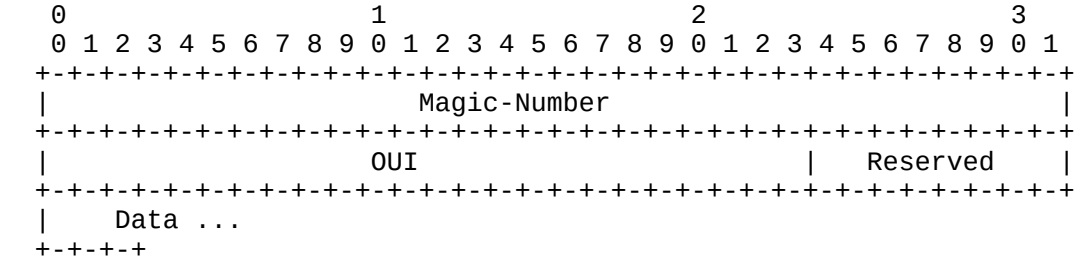
When VSNCP is in Opened state, VSNP packets may be sent by setting the PPP Protocol field to hex 005b (VSNP) and placing the vendor-specific data in the PPP Information field. No restrictions are placed on this data.

# 3. PPP Vendor-Specific Protocol (VSP)

The Vendor-Specific Protocol (VSP) is intended for use in situations where the implementation of a complete Network Layer Protocol is unnecessary, or where per-link signaling is required (see Section 7 below).

VSP packets MUST NOT be sent until PPP has reached either Network-Layer Protocol or Authentication phase. VSP packets received before those phases MUST be silently ignored. Once the proper phase has been reached, a VSP packet containing an unrecognized OUI value SHOULD be returned using LCP Protocol-Reject.

Exactly one VSP packet is carried in the PPP Information field, with the PPP Protocol field set to 405b (VSP). A summary of the VSP packet format is shown below. The fields are transmitted from left to right.




Magic-Number

The four-octet Magic-Number field is used to detect looped-back links. If the Magic-Number Option was not negotiated by LCP, then this field MUST be set to 0. Implementation of the LCP Magic-Number Option is RECOMMENDED.

OUI

This three-octet field contains the vendor's Organizationally Unique Identifier. The bits within the octet are in canonical order, and the most significant octet is transmitted first. See Section 5 below for more information on OUI values.

Reserved

Reserved for future definition. Must be zero on transmit and ignored on reception.

Data

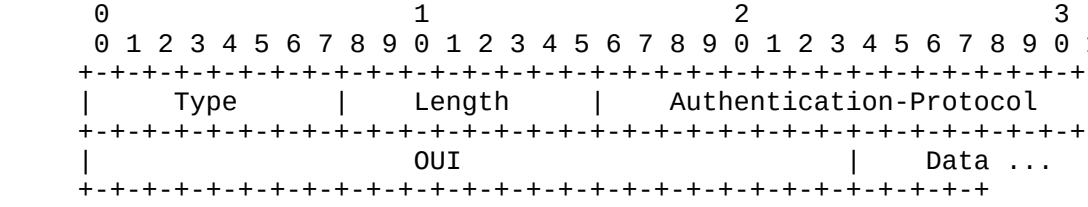
Vendor-specific data.

## 4. PPP Vendor-Specific Authentication Protocol (VSAP)

The Vendor-Specific Authentication Protocol (VSAP) is used in two ways. First, it is used with the LCP Authentication Option in order to negotiate the use of a vendor-specific authentication protocol to be used during the PPP Authentication phase. Second, it is used in the PPP Protocol field to carry those proprietary authentication messages during the PPP Authentication phase.

### 4.1. VSAP Authentication Option Format

This option is used in LCP Configure-Request, -Ack, -Nak, and -Reject messages.




Type

3

Length

>=7

Authentication-Protocol

The hex value c05b, in Network Byte Order.

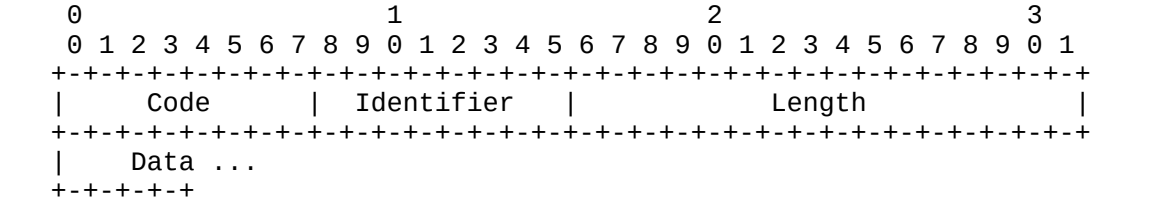
OUI

This three-octet field contains the vendor's Organizationally Unique Identifier. The bits within the octet are in canonical order, and the most significant octet is transmitted first. See Section 5 below for more information on OUI values.

Data

This optional field contains options or other information specific to the operation of the vendor-specific authentication protocol.

## 4.2. VSAP Authentication Data Format




The Identifier and Length fields are as for LCP. The Code and Data fields and the processing of the messages are defined by the vendor-specific protocol.

However, it is RECOMMENDED that vendor-specific protocols use Code 3 for "Success" and Code 4 for "Failure," as with [4] and [5], in order to simplify the design of network monitoring equipment.

# 5. Organizationally Unique Identifiers

The three-octet Organizationally Unique Identifier (OUI) used in the messages described in this document identifies an organization ("vendor") that defines the meaning of the message. This OUI is based on IEEE 802 vendor assignments.

Vendors that desire to use their IEEE 802 OUI for a PPP Vendor Protocol SHOULD also register the assigned OUI with IANA for the benefit of the community.

A vendor that does not otherwise need an IEEE-assigned OUI can request a PPP-specific OUI from the IANA. This OUI shall be assigned from the CF0000 series. This procedure is defined for vendors that are not able to use IEEE assignments, such as software-only vendors.

## 6. Multiple Vendor-Specific Protocols

Vendors are encouraged to define their protocols to allow for future expansion, where necessary. For example, it may be appropriate for a VSNP to include a locally-defined selector field to distinguish among multiple proprietary protocols carried via this mechanism, and appropriate Configuration Options in VSNCP to enable and disable these sub-protocols. Because the requirements of such a selector are known only to the vendor defining such protocols, they are not described further in this document.

An implementation MAY also support more than one vendor-specific protocol, distinguished by OUI. In this case, the implementation MUST also treat LCP Protocol-Reject specially by examining the OUI field in the rejected message and disabling only the protocol to which it refers, rather than all use of the vendor-specific protocol number. Note that such an implementation is compatible with a simple implementation that supports only one OUI: that implementation will respond with LCP Protocol-Reject for unrecognized OUIs and otherwise leave the negotiation state unmodified.

An OUI-distinguished mechanism is expected to be used only in the case of cooperating vendors. Vendors are encouraged to use just a single OUI for all protocols defined by that vendor, if possible.

## 7. Multilink, Compression, and Encryption Considerations

The Vendor-Specific Network Protocol (VSNP) is defined to operate at the bundle level if Multilink PPP [6] is in use, and also above any Compression Protocols [7] and Encryption Protocols [8] in use.

The Vendor-Specific Protocol (VSP) is defined to operate at the per-link level if Multilink PPP is in use, and MUST NOT be subjected to data compression. If a per-link encryption protocol is in use, then VSP packets MUST be encrypted.

Note that because VSP is defined at the per-link level, bundle level encryption does not affect VSP.

## 8. Security Considerations

The security of any vendor-specific authentication protocol is subject to the provisions of that proprietary mechanism. Implementations that wish to avoid security problems associated with such protocols SHOULD send LCP Configure-Nak in response to an LCP Configure-Request specifying VSAP, or MAY terminate operation.

When operating with PPP encryption, but without Multilink PPP, VSP packets are sent in the clear. Implementations that require PPP encryption as part of a security mechanism should consider whether to employ per-link encryption or forego use of VSP in favor of VSNP.

The security of vendor-specific networking protocols is likewise subject to the security mechanisms defined by those protocols. Independent analysis of the security of any such protocol is RECOMMENDED.

## 9. IANA Considerations

IANA has assigned four similarly-numbered PPP Protocol field values, 005b, 405b, 805b, and c05b, as described in Section 1 of this document.

As described in Section 5 above and in [3], the IANA also maintains a CF0000 series block of non-IEEE OUIs that may be allocated for vendors that do not otherwise need an IEEE-assigned OUI.

## 10. References

### 10.1. Normative References

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

[2] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

### 10.2. Informative References

[3] Simpson, W., "PPP Vendor Extensions", RFC 2153, May 1997.

[4] Simpson, W., "PPP Challenge Handshake Authentication Protocol (CHAP)", RFC 1994, August 1996.

[5] Blunk, L. and J. Vollbrecht, "PPP Extensible Authentication Protocol (EAP)", RFC 2284, March 1998.

[6] Sklower, K., Lloyd, B., McGregor, G., Carr, D. and T. Coradetti, "The PPP Multilink Protocol (MP)", RFC 1990, August 1996.

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

[8] Meyer, G., "The PPP Encryption Control Protocol (ECP)", RFC 1968, June 1996.

## 11. Acknowledgments

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