

## PPP Over AAL5

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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.

This document describes the use of ATM Adaptation Layer 5 (AAL5) for framing PPP encapsulated packets.

### Applicability

This specification is intended for those implementations which desire to use the facilities which are defined for PPP, such as the Link Control Protocol, Network-layer Control Protocols, authentication, and compression. These capabilities require a point-to-point relationship between the peers, and are not designed for the multi-point relationships which are available in ATM and other multi-access environments.

## 1. Introduction

ATM AAL5 protocol is designed to provide virtual connections between end stations attached to the same network. These connections offer a packet delivery service that includes error detection, but does not do error correction.

Most existing implementations of PPP use ISO 3309 HDLC as a basis for their framing [3].

When an ATM network is configured with point-to-point connections, PPP can use AAL5 as a framing mechanism.

## 2. Conventions

The keywords MUST, MUST NOT, REQUIRED, SHALL, SHALL NOT, SHOULD, SHOULD NOT, RECOMMENDED, MAY, and OPTIONAL, when they appear in this document, are to be interpreted as described in [10].

## 3. AAL5 Layer Service Interface

The PPP layer treats the underlying ATM AAL5 layer service as a bit-synchronous point-to-point link. In this context, the PPP link corresponds to an ATM AAL5 virtual connection. The virtual connection MUST be full-duplex, point to point, and it MAY be either dedicated (i.e. permanent, set up by provisioning) or switched (set up on demand). In addition, the PPP/AAL5 service interface boundary MUST meet the following requirements:

Interface Format - The PPP/AAL5 layer boundary presents an octet service interface to the AAL5 layer. There is no provision for sub-octets to be supplied or accepted.

Transmission Rate - The PPP layer does not impose any restrictions regarding transmission rate or the underlying ATM layer traffic descriptor parameters.

Control Signals - The AAL5 layer MUST provide control signals to the PPP layer which indicate when the virtual connection link has become connected or disconnected. These provide the "Up" and

"Down" events to the LCP state machine [1] within the PPP layer.

#### 4. Multi-Protocol Encapsulation

This specification uses the principles, terminology, and frame structure described in "Multiprotocol Encapsulation over ATM Adaptation Layer 5" [4].

The purpose of this specification is not to document what is already standardized in [4], but to specify how the mechanisms described in [4] are to be used to map PPP onto an AAL5-based ATM network. Section 1 within [4] defines the two mechanisms for identifying the Protocol Data Unit (PDU) payload field's protocol type: virtual circuit based multiplexing, and Logical Link Control (LLC) encapsulation. In the former technique, the payload's protocol type is implicitly agreed to by the end points for each virtual circuit using provisioning or control plane procedures. When using the LLC encapsulation technique, the payload's protocol type is explicitly identified on a per PDU basis by an in-band LLC header, followed by the payload data.

When transporting a PPP payload over AAL5, an implementation:

1. MUST support virtual circuit multiplexed PPP payloads as described in section 5 below by mutual configuration or negotiation of both end points. This technique is referred to as "VC-multiplexed PPP".
2. MUST support LLC encapsulated PPP payloads on PVCs as described in section 6 below by mutual configuration or negotiation of both end points. This technique is referred to as "LLC encapsulated PPP".
3. For SVC set up, an implementation MUST negotiate using the Q.2931 [9] Annex C procedure, encoding the Broadband Lower Layer Interface (B-LLI) information element to signal either VC-multiplexed PPP or LLC encapsulated PPP. The details of this control plane procedure are described in section 7.

If an implementation is connecting through a Frame Relay/ATM FRF.8 [7] service inter-working unit to an RFC 1973 [6] end point, then it MUST use LLC encapsulated PPP payloads. Frame Relay/ATM FRF.8 inter-working units are exempted from the requirement to support VC-multiplexed PPP. This exemption allows the FR/ATM IWU to remain compliant with FRF.8 when the PPP over AAL5 end point is inter-operating with an RFC 1973 end point.

## 5. Virtual Circuit Multiplexed PPP Over AAL5

The AAL5 PDU format is shown in figure 1:

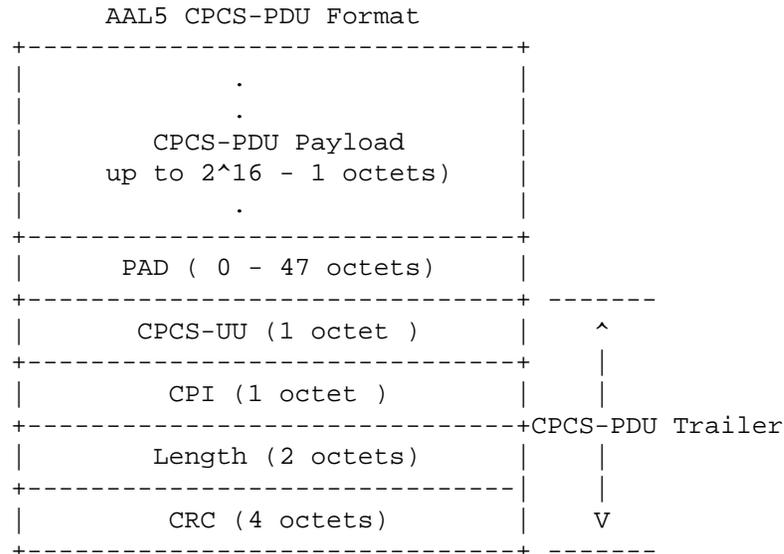


Figure 1

The Common Part Convergence Sub-layer (CPCS)-PDU Payload field contains user information up to  $2^{16} - 1$  octets.

The PAD field pads the CPCS-PDU to fit exactly into the ATM cells such that the last 48 octet cell payload created by the SAR sublayer will have the CPCS-PDU Trailer right justified in the cell.

The CPCS-UU (User-to-User indication) field is used to transparently transfer CPCS user to user information. The field has no function under the multi-protocol ATM encapsulation described in this memo and can be set to any value.

The CPI (Common Part Indicator) field aligns the CPCS-PDU trailer to 64 bits. Possible additional functions are for further study in ITU-T. When only the 64 bit alignment function is used, this field shall be coded as 0x00.

The Length field indicates the length, in octets, of the Payload field. The maximum value for the Length field is 65535 octets. A Length field coded as 0x00 is used for the abort function.

The CRC field protects the entire CPCS-PDU except the CRC field itself.

A VC-multiplexed PPP frame SHALL constitute the CPCS-PDU payload and is defined as:

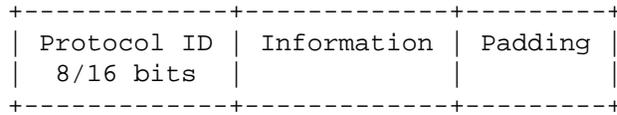


Figure 2

Each of these fields are specifically defined in [1].

#### 6. LLC Encapsulated PPP Over AAL5

LLC encapsulated PPP over AAL5 is the alternative technique to VC-multiplexed PPP over AAL5.

The AAL5 CPCS-PDU payload field is encoded as shown in figure 3. The pertinent fields in that diagram are:

1. LLC header: 2 bytes encoded to specify a source SAP and destination SAP of routed OSI PDU (values 0xFE 0xFE), followed by an Un-numbered Information (UI) frame type (value 0x03).
2. Network Layer Protocol IDentifier (NLPID) representing PPP, (value 0xCF).
3. the PPP protocol identifier field, which can be either 1 or 2 octets long. See reference [1].
4. followed by the PPP information field as per Figure 2.

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