Project: VDSL, SDSL, ADSL

Title: Proposed Changes to PoDSL

Source: FTW

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Abstract:

This paper points out some of the deficiencies of the current ITU packet over DSL proposals and proposes some changes to the packet frame format.

Distribution: ETSI STC TM6 working group members

Status: For information and decision

1. Introduction

In the recent rush to standardize packet over VDSL some unfortunate features was let into the current PoDSL proposals for VDSL, ADSL, and SDSL.

The first problem is the static address and control fields (in total two bytes) that always need to be sent. As these two fields fill no purpose at all for DSL they only bring unnecessary overhead! (They are a legacy from pulling dumb terminals in old IBM network architectures) Two bytes overhead might not seem big in relation to IP header overhead, but if header compression is used for the packet transport the header lengths (IP/UDP/RTP) many times will only be one or two bytes, thus the overhead can be significant.

The second problem is the mandated two byte frame check sum (FCS). The problem is not the FCS itself, as it may very well be needed, but the fixed size. To highlight the problem we give an example. Assume that the layer above the gamma interface wants to send Ethernet packets, furthermore that it is found that the standard Ethernet checksum is not enough to protect the data over this link (thus wanting to use a 4 byte FCS). In this situation the current two bytes of PoDSL FCS are just unnecessary overhead. Another situation is again when Ethernet is transmitted and the two bytes Ethernet FCS is enough and the PoDSL FCS brings no extra protection (thus again unnecessary overhead).

The root of this problem is that there are demands on the frame structure (i.e. the address field, control field, and the FCS) that are unnecessary in order to support the gamma interface. In other words, to support a gamma interface only the basic framing mechanism (start/stop and escape) is needed and it should be up to the layer above to decide on the need (and size) of PoDSL FCS.

Conclusion One
The fields address, control and FCS should not be part of the framing structure below the gamma interface.

It is further noted that before a PoDSL specification is useful the layer above the gamma interface needs to be specified. Noting the point-to-point nature of the DSL transmission and looking for suitable generic packet transport mechanism we find the prime candidate to be PPP (point-to-point protocol), defined in RFC 1661 and 1662.

Citing from RFC 1661:

```
The Point-to-Point Protocol is designed for simple links which
transport packets between two peers. These links provide full-duplex
simultaneous bi-directional operation, and are assumed to deliver
packets in order. It is intended that PPP provide a common solution
for easy connection of a wide variety of hosts, bridges and routers.

Encapsulation

The PPP encapsulation provides for multiplexing of different
network-layer protocols simultaneously over the same link. The
PPP encapsulation has been carefully designed to retain
compatibility with most commonly used supporting hardware.
Only 8 additional octets are necessary to form the encapsulation
when used within the default HDLC-like framing. In environments
where bandwidth is at a premium, the encapsulation and framing may
be shortened to 2 or 4 octets.
```

```
To support high speed implementations, the default encapsulation
uses only simple fields, only one of which needs to be examined
for demultiplexing. The default header and information fields
fall on 32-bit boundaries, and the trailer may be padded to an
arbitrary boundary.
```

As PPP is based on a HDLC like framing the address/control and FCS fields turn up again. There are however, two crucial differences compared to the current PoDSL proposal. The first difference is that these fields are negotiable, thus through negotiations we can turn the address/control fields on or off. Likewise we can negotiate the size of the FCS fields to 0, 2 or 4 bytes. The second crucial difference is that the PPP specifies a packet type fields (2 bytes). This enables PPP to transport various packet types (even on the same time) transparently and facilitate per protocol parameter negotiations.

From RFC 1662:

```
A summary of the PPP HDLC-like frame structure is shown below. This
figure does not include bits inserted for synchronization (such as
start and stop bits for asynchronous links), nor any bits or octets
inserted for transparency. The fields are transmitted from left to
right.
+----------+----------+----------+
| Flag     | Address  | Control  |
| 01111110 | 11111111 | 00000011 |
+----------+----------+----------+
+----------+-------------+---------+
| Protocol | Information | Padding |
| 8/16 bits|     *       |    *    |
+----------+-------------+---------+
+----------+----------+-----------------
| FCS      | Flag     | Inter-frame Fill
|16/32 bits| 01111110 | or next Address
+----------+----------+-----------------
```

There are some default parameters necessary for a PPP communication and two set of default values are set in RFC 1662. For PoDSL it is suggested that the address/control field is set to off by default and that the FCS length is set to 4 bytes.

Conclusion Two
By using the well-established PPP protocol [1,2] the gamma interface would have an efficient and sufficiently flexible protocol to support the intention of the packet mode in DSL.

Proposal

We propose that ETSI sends a Liaison to ITU requesting to remove the address/control field and the FCS field from the framing structure below the gamma interface, based on the arguments given in this WD. We further ask ETSI to recommend ITU to consider specifying the PPP protocol on top of the gamma interface.

References

[1] Simpson, W., "The Point-to-Point Protocol (PPP)", STD 51, RFC 1661, July 1994.
[2] Simpson, W., "PPP in HDLC-like Framing", STD 51, RFC 1662, July 1994.