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PPPv6 Problem statement and requirements
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Abstract

As in IPv4 network, PPP (PPPoE) will still be an important mechanism to provide access services to broadband subscribers of IPv6 or dual-stack. This document describes problems the ISPs faced when deploying IPv6 in broadband access network over PPP, particularly, the capabilities lacked in IPv6CP.

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on September 15, 2011.

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1. Introduction

The Point-to-Point Protocol (PPP) provides a standard method for transporting multi-protocol datagrams over point-to-point links. PPP defines an extensible Link Control Protocol (LCP) and a family of Network Control Protocols (NCPs) for establishing and configuring different network-layer protocols.

While based on the current capabilities of the IPv6 Control Protocol (IPv6CP) which is used for the negotiation of IPv6 parameters over PPP, only Interface-Identifier can be negotiated, other parameters such as IPv6 Address, DNS server addresses and delegated prefix have to be configured by other means rather than IPv6CP.

1.1. Requirements Language

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 [RFC2119].

2. Problem Statement

In current practice, after the LCP and the authentication (if required) phases are completed, the corresponding network-layer control protocol, IPCP will be used to negotiate all the IP layer elements needed between subscriber devices and the Broadband Network Gateway (BNG). This is fairly an efficient and robust means which collaborates quite well with other mechanisms like those for AAA, when providing access services in variable environments.

While in IPv6 currently the configuration of IPv6 link can't be accomplished by the NCP (IPv6CP) itself. The lack of Configuration Options defined in IPv6CP results in following problems:

1. The process of IP elements configuration is quite complicated.

After entering the IPv6CP phase, one or more extra control protocols such as ND, DHCPv6, (and/or DHCPv6-PD) must be introduced, as currently there is only one configuration option define in IPv6CP for interface-ID negotiation. Additionally, the status 'OPEN' of IPv6CP negotiation cannot be treated as the sign of access service!_s ready and triggers corresponding AAA activities, for instance' Accounting START'.

2. Some unnecessary functions will be involved. For example, functions like Address Resolution, On-link Prefix List Advertisement, Default Router Advertisement, etc. defined in ND are actually not needed for a simple PPP link.

3. The co-existence of multiple protocols with functionalities partially overlapped will lead to interoperation problems in the implementation as individual active state machine has to be maintained for each protocol which can result in conflicts (such as multiple lifetime counters). Additionally, more transaction steps caused by extra control protocols introduced will result in longer response time and higher risk of exception.

4. ISPs have to change current network infrastructure accordingly, such as installing new DHCPv6 servers somewhere in the network (standalone or embedded) which will increase both CAPEX and OPEX.

5. Some unnecessary functions will be involved. For example, functions like Address Resolution, On-link Prefix List Advertisement, Default Router Advertisement, etc. defined in ND are actually not needed for a simple PPP link.

6. At the LNS, if we filter traffic to be from the router IP addresses on all of our DSL lines to avoid spoofing, the FE80:: link local address is not allowed through the source filtering as it is link local and so not allowed on to the network. This filtering has to be modified to allow FE80:: addresses for SLAAC or DHCPv6 but then be blocked at a later stage.

3. Requirements

To keep the implementation simple and stable, the problems described above must be solved. During the transition from IPv4 to IPv6, if

ISPs choose to run IPv4 and IPv6 over one single PPP link for dual-stack subscribers, it is more feasible to unify the way of configuring both IPv4 and IPv6.

From the ISP's point of view, it is more reasonable to extend the IPv6CP functions needed for PPP by the same means of IPCP which is mature and widely implemented rather than introducing extra control protocols. To establish basic IPv6 connectivity over PPP, the following Configuration Options need to be defined:

1. IPv6 address;

2. Delegated IPv6 prefix;

3. DNS server addresses (primary and alternative);

Also, Configuration Options for other functions may be considered in the future.

4. Acknowledgements

Part of this text borrows from the previous RFCs and I-Ds. And as such is partially based on previous work done by the PPP working group. Thanks to Jacni Qin, Qian Wang and Qiong Sun for useful feedback.

5. IANA Considerations

This document includes no request to IANA.

6. Security Considerations

No new security concerns raised out of this document.

7. References

7.1. Normative References

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