IPv6 CE Routers LAN Prefix Delegation

Abstract

   This document defines requirements for IPv6 CE Routers to support
   DHCPv6 Prefix Delegation for redistributing any unused prefix(es)
   that were delegated to the IPv6 CE Router. This document updates RFC
   7084.

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

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1. Introduction

This document defines DHCPv6 Prefix Delegation in IPv6 CE Routers
([RFC7084]) in order to properly utilize the IPv6 prefixes assigned
by service providers. Many ISP will assign a prefix larger then /64
to the CE Router, as recommended in [RFC6177]. If an IPv6 CE Router
doesn't support IA_PD on the LAN it will not be able to assign any
prefixes beyond itself, limiting the usefulness of assigning
prefixes larger than /64. Supporting IA_PD on the LAN interfaces
will allow for those unused prefixes to be distributed into a
network. This document does not cover dealing with multi-provisioned
networks with more than one provider.

2. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT",
"SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and
"OPTIONAL" in this document are to be interpreted as described in
BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all
capitals, as shown here.

This document also makes use of internal conceptual variables to
describe protocol behavior and external variables that an
implementation must allow system administrators to change. The
specific variable names, how their values change, and how their
settings influence protocol behavior are provided to demonstrate
protocol behavior. An implementation is not required to have them in
the exact form described here, as long as its external behavior is
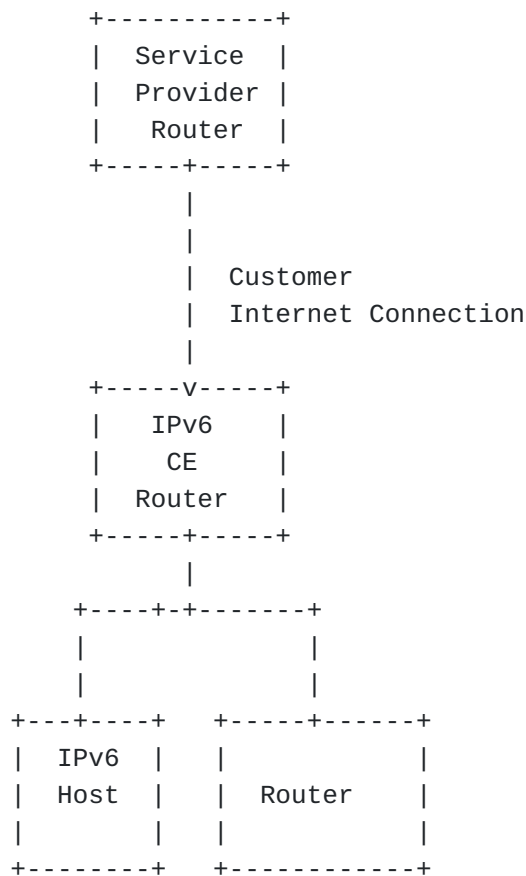consistent with that described in this document.

3. Terminology

The following terminology is defined for this document.

*IPv6 CE Router: A router intended for home or small-office use
 that forwards packets not explicitly addressed to itself as
 defined in [RFC7084].

*Internet Service Provider (ISP): An entity that provides access
 to the Internet. In this document, a service provider
 specifically offers Internet access using IPv6, and may also
 offer IPv4 Internet access. The service provider can provide such
 access over a variety of different transport methods such as DSL,
 cable, wireless, and others.

4. Architecture

```
                +-----------+
                |  Service  |
                | Provider  |
                |   Router  |
                +-----+-----+
                      |
                      |
                      |  Customer
                      |  Internet Connection
                      |
                +-----v-----+
                |   IPv6    |
                |    CE     |
                |  Router   |
                +-----+-----+
                      |
                +----+-+-------+
                |              |
                |              |
            +---+----+    +-----+------+
            |  IPv6  |    |            |
            |  Host  |    |  Router    |
            |        |    |            |
            +--------+    +------------+
```

5. Requirements

The IPv6 CE Router distributes configuration information obtained
during WAN interface provisioning to IPv6 hosts and routers.
Previously, a router based on [RFC7084] would only provide IPv6
hosts with individual addresses; this update allows for addressing
and routing of IPv6 prefixes to both hosts and routers.

LAN Prefix Delegation (PD) Requirements

LPD-1: The IPv6 CE Router MUST support a DHCPv6 server capable of
IPv6 prefix assignment according to [RFC8415] (Identity Association
for Prefix Delegation (IA_PD) option).

LPD-2: The IPv6 CE Router MUST assign a prefix from the delegated
prefix to each of its LAN links. If not enough addresses are
available the IPv6 CE Router SHOULD log a system management error.

LPD-3: The prefix assigned to a link MUST NOT change in the absence
of topology or configuration changes.

LPD-4: After LAN link prefix assignment the IPv6 CE Router MUST make
the remaining IPv6 prefixes available to other routers via Prefix
Delegation

LPD-5: Available prefixes must be provisioned IA_PD IA prefixes MUST
have a prefix-length of 64.

LPD-6: The IPv6 CE Router MUST install a route to the assigned IA_PD
with a next-hop of the IPv6 node that was assigned the prefix. The
IPv6 CE Router MUST remove the route when IA_PD lease expires.

LPD-7: By default, the IPv6 CE Router firewall MUST allow forwarding
of packets with an outer IPv6 header containing a source address
belonging to Delegated Prefixes, along with reciprocal packets from
the same flow, following the recommendations of [RFC6092]

LPD-8: If an IPv6 CE Router receives a single IA_PD IA Prefix with a
prefix-length of 64. IPv6 prefixes of size 64 it MUST act as
delegating relay according to [RFC8987] specifically requirements
G-2 to G-7, G-9, and S-2. DHCPv6 messages without IA-PD option MUST
NOT be relayed.

LPD-9: A CE Router MUST only be a delegating relay with DHCPv6
messages with IA_PD options present.

LPD-10: A CE Router assigning prefixes MUST NOT assign IA_NA in the
same DHCPv6 exchange.

6. Security Considerations

This document does not add any new security considerations beyond
those mentioned in Section 4 of [RFC8213] and Section 22 of
[RFC8415].

7. IANA Considerations

This document makes no request of IANA.

8. Acknowledgements

9. References

9.1. Normative References

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9.2. Informative References

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