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Service Provider Edge Router Interaction
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Abstract

This document describes the interaction between a Service Provider Gateway fixed at the home edge, and the Home Networking interior routers. It assesses the interactions between existing routers implementing [RFC7084] and the Home Networking routers. The document will also define the interactions between other Service Provider Edge Router (eg. HIPnet) and Home Networking router.

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[1.](#) Introduction

This document defines the interactions between the future Homenet network and 7084 Routers and Service Provider Edge Routers (SPER). In the future the SPER will be full Homenet routers but there will be a period of transition. This document specifies how currently deployed SPER will interact with Homenet architecture [I-D.ietf-homenet-arch]. The goal of this document is to make recommendations on issues uncovered to make the devices work with the future Homenet.

These recommendations may result in requirements for the Homenet routers.

[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.](#) Terminology

For purposes of this report the Design Team adopts the following terminology.

- o Border: a point, typically resident on a router, between two networks. A basic example is between the main internal homenet and a guest network. This also defines point(s) at which filtering and forwarding policies for different types of traffic may be applied. For the purpose of this document we use the Default Border Definition [[I-D.kline-homenet-default-perimeter](#)] to describe how the Border is discovered.
- o SPER: Service Provider Edge Router: A border router intended for home or small-office use that forwards packet explicitly addressed as defined [[I-D.grundemann-homenet-hipnet](#)] or [[BBF.TR124](#)] connecting the homenet to a service provider network.
- o Homenet: Home network consisting of routers interacting with each other using a dynamic routing protocol for prefix allocation and reachability. Examples include Prefix Assignment [[I-D.arkko-homenet-prefix-assignment](#)] and OSPFv3 Auto-Configuration [[I-D.ietf-ospf-ospfv3-autoconfig](#)]
- o Homenet Naming and Service Discovery: The Homenet supports the ability for users and devices to be able to discover devices and services available in the Homenet. Currently the mechanism is undefined but methods such as DNSSD [[RFC6763](#)], [[SSDP](#)], Hybrid model using [[I-D.cheshire-dnssd-hybrid](#)] or DNS-Based Service Discovery using OSPFv3 [[I-D.stenberg-homenet-dnssdext-hybrid](#)]

proxy-ospf] could be used to solve this issue.

- o 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.
- o 7084: A router intended for home or small-office use that forwards packet explicitly addressed to itself as defined in [[RFC7084](#)]

[3.](#) Border Discovery

According to [[I-D.kline-homenet-default-perimeter](#)] there are 3 types of product interfaces: external, internal, and mixed. Border Discovery is the process of discovering the interface types. Below we describe the the 3 choices.

[3.1.](#) All Ports Discovery

Border Discovery must be performed on all interfaces. Legacy Routers that don't support Homenet will not participate in Border Discovery

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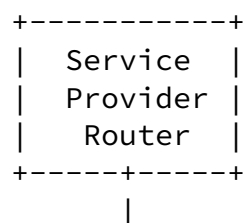
and are considered to be external to the Homenet Border.

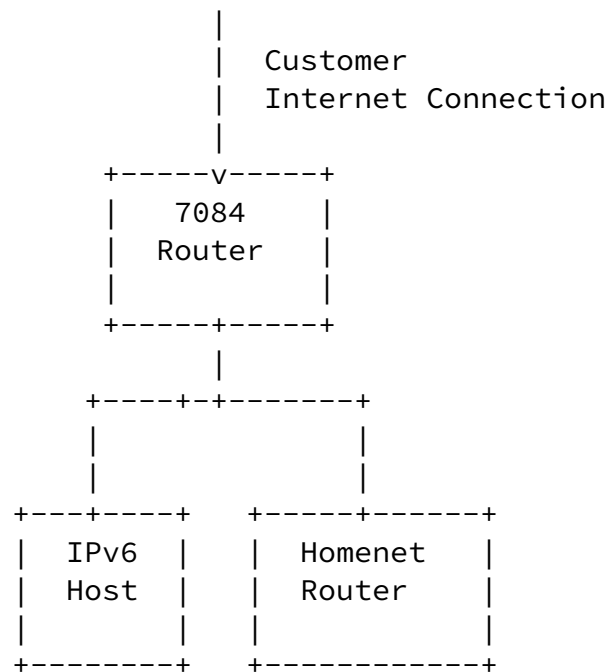
[3.2.](#) WAN Port defined As External

WAN ports are permanently defined as external requiring no discovery. LAN ports perform Border Discovery. This requires that the user connect the WAN interface to the ISP or SPER defining the boundary. All other ports are in border discovery mode. The advantage of this approach is that it allows the Homenet to have multiple egress ports.

[4.](#) Home Networking Scenarios

[4.1.](#) 7084 to Homenet





4.1.1. Addressing

A 7084 Router acquires addresses to provision the LAN through DHCP Prefix Delegation [[RFC3633](#)]. A 7084 Router will assign a separate /64 from the set of delegated prefix(es) for each LAN interfaces. The Router can assign addresses to the LAN hosts using either SLAAC or DHCP. There is no requirement for redistributing any unused prefix(es) that were delegated to the 7084 Router. Support of IA_PD on the LAN interface is not required for a 7084 Router. If a 7084 Router does not support IA_PD on the LAN interface the Homenet will not receive a prefix allocation, and therefore will not have global addressing for the entire Homenet.

4.1.2. Routing

A 7084 Router learns default routes through Router Advertisements on the WAN interface. Routes are installed when a prefix is assigned to a LAN interface. All other Home Routing information requires user configuration.

A 7084 Router will NOT forward packets from an unrecognized source address. Any IPv6 packets routed from the Homenet would receive an ICMPv6 Destination Unreachable message. This restricts the Homenet to internal communications only. Packets with unrecognized

destination addresses in the Homenet MAY pass thru a 7084 Router if configured. This configuration might be done thru the mechanism such a IA_PD or direct configuration.

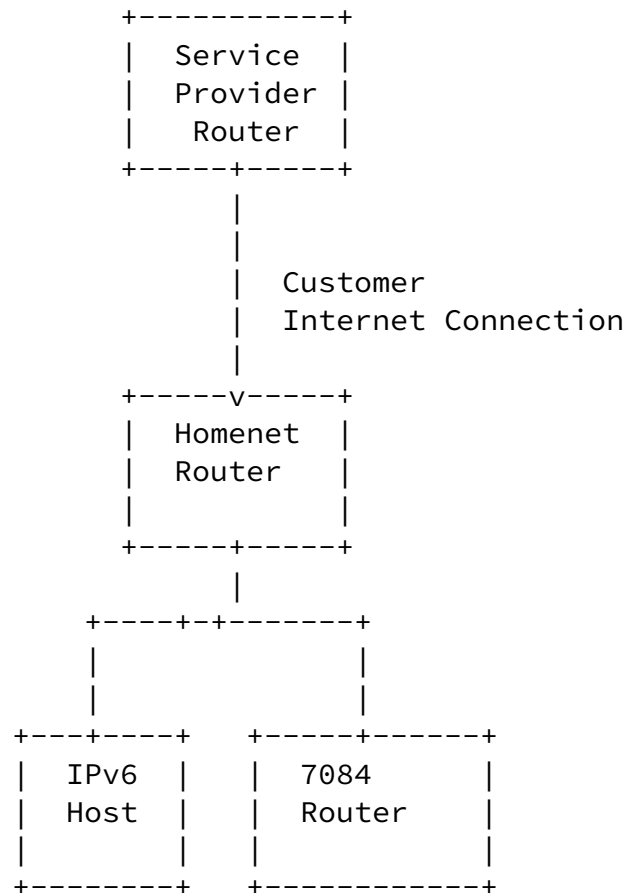
[4.1.3.](#) Border

A 7084 Router does not have a method for participating in Homenet border discovery. A 7084 Router and any hosts connected to the Router are considered to be as External to the Homenet. A Homenet Router is recommended to support a configuration method that will allow the border to include the 7084 Router as Internal to the Homenet.

[4.1.4.](#) Service Discovery into the Homenet

For service discovery to works routers need to forward multicast traffic appropriately enabling server discovery across the home network. A 7084 Router does not have any requirements for supporting multicast forwarding. Based on this knowledge it is unlikely that Service Discovery between the 7084 and Homemnet will work.

[4.2.](#) Homenet to 7084



[4.2.1.](#) Addressing

A 7084 Router needs to receive an IA_PD to allow devices on LAN interfaces to be addressed. For addressing to work properly the Homenet must provide IA_PDs when requested.

[4.2.2.](#) Routing

When a Homenet Router is assigned an IA_PD it MUST install routes for the prefixes into the Homenet Routing infrastructure. This will allow packets to be routed from the Homenet to the 7084 Router. A 7084 Router only needs a Router Advertisement with a valid Router Lifetime to route into the Homenet.

[4.2.3.](#) Border

A Homenet Router with the firewall on might not allow valid traffic from devices connected to the 7084 Router. When a Homenet Router is assigned an IA_PD there needs to be a secure way for the Homenet Border to allow IPv6 traffic to flow from the 7084 router into the Homenet or Internet.

[4.2.4.](#) Service Discovery into the Homenet

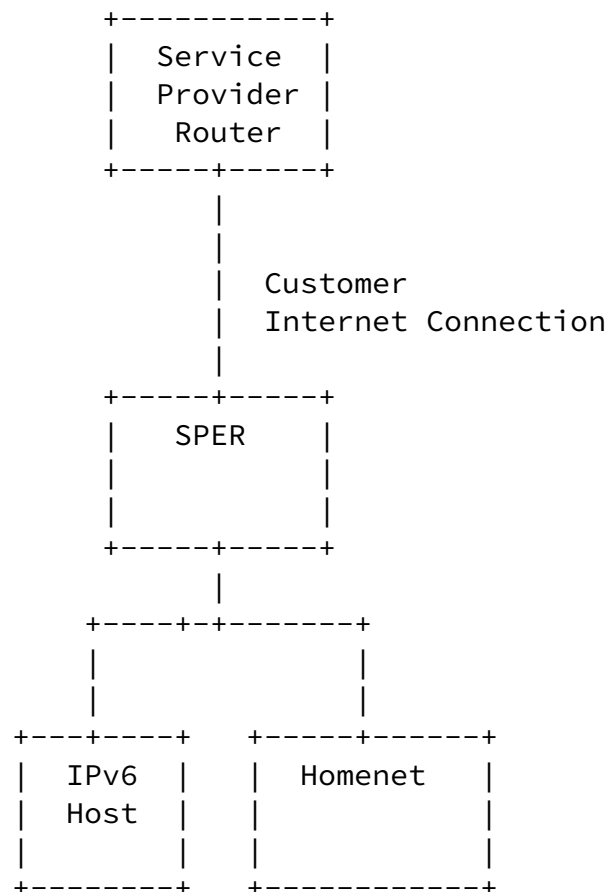
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For service discovery to work routers need to forward multicast traffic appropriately enabling server discovery across the home network. A 7084 Router does not have any requirements for supporting multicast forwarding. Based on this knowledge it is unlikely that Service Discovery between the 7084 and Homenet will work.

[4.3.](#) Service Provider Edge Router (SPER) to Homenet



[4.3.1.](#) Addressing

SPERs use DHCPv6 prefix sub-delegation to build the network [I-D .grundemann-homenet-hipnet]. If the prefix is larger than a single / 64 prefix the SPER will subdivide the IPv6 prefix received via DHCPv6 [[RFC3315](#)]. Using Recursive Prefix Delegation allows the Homenet to receive prefixes that can be used to address the network.

[4.3.2.](#) Routing

Leveraging the recursive prefix delegation method described above, a SPER installs a route to the WAN interface of the router which delegated the prefixes. With this routing information the SPER is able to properly route packets to and from the Homenet.

[4.3.3.](#) Border

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A SPER implements a stateful [[RFC6092](#)] firewall which may be have it enabled. This stateful firewall will allow homenet traffic to leave the network. It is limited to only returning traffic originated from the Homenet. No connections can be originated from outside of the Homenet.

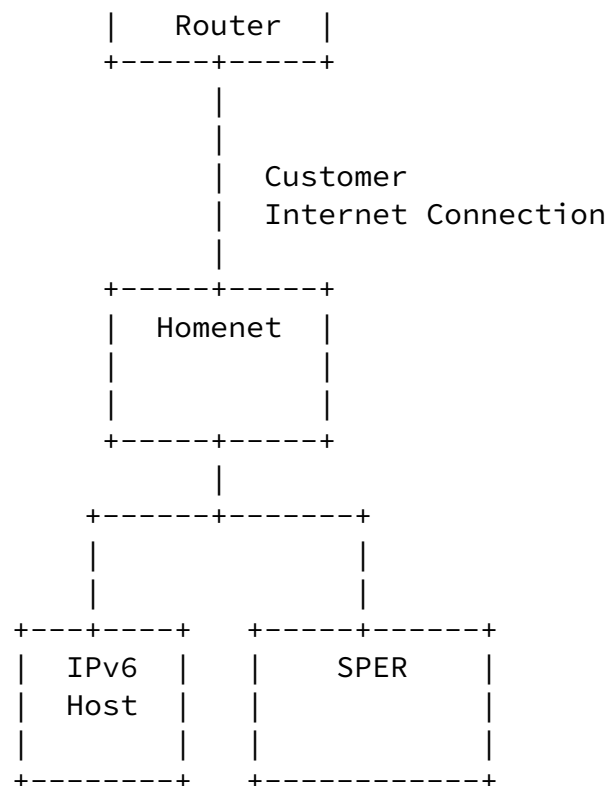
A Homenet Router with the firewall on might not allow valid traffic from devices connected to the HIPnet SPER. A Homenet Router will be able to detect a SPER based on a CER_ID, [I-D.donley-dhc-cer-id-option], SPER MUST include an CER_ID option with an address that is not the unspecified address (:::). This allows for the Homenet Router to detect a SPER allowing native IPv6 traffic through the firewall so that traffic can flow between the SPER and Homenet.

[4.3.4.](#) Service Discovery

Both the Homenet and SPER have several common protocols that can be used for service discovery such as mDNS [[RFC6762](#)], DNS-SD [[RFC6763](#)], and [[SSDP](#)]. Both the SPER and Homenet Routers may have host directly connected that are using them as DNS servers. If the SPER advertises itself as the DNS-SD server for connected host, the host could query the SPER. The issue that arises with this configuration is the HIPnet Router currently has no method for finding the Homenet router to query when trying to resolve DNS.

[4.4.](#) Homenet to SPER

```
+-----+
|  Service  |
|  Provider |
```



[4.4.1.](#) Addressing

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A SPER needs to receive an IA_PD to address IPv6 host and routers behind it. If a large enough prefix is assigned, /56 for example, the SPER will attempt further sub-delegation. This will not be optimized for the network but will still function properly. For addressing between the SPER and Homenet to work properly the Homenet must provide IA_PDs when requested.

[4.4.2.](#) Routing

When a Homenet Router assigns an IA_PD to the SPER it MUST install routes for the prefixes into the Homenet Routing infrastructure. This will allow packets to be routed from the Homenet to the SPER. If there are two ingress paths to the SPER, the sub-optimal path will be chosen based on the interface that assigned the IA_PD.

[4.4.3.](#) Border

A Homenet Router with the firewall enabled might not allow valid traffic from devices connected to the SPER or addressed by the SPER to enter the Homenet. When a Homenet Router assigns an IA_PD there

needs to be a secure way for the Homenet Border to allow IPv6 traffic to flow from the SPER into the Homenet or Internet.

[4.4.4.](#) Service Discovery into the Homenet

For service discovery to work routers need to forward multicast traffic appropriately enabling server discovery across the home network.

[5.](#) Security Considerations

[6.](#) IANA Considerations

This document makes no request of IANA.

[7.](#) Acknowledgements

The Homenet Design Team: Mikael Abrahamsson, Ray Bellis, John Brzozowski, Lorenzo Colitti, Tim Chown, Chris Donley, Markus Stenberg, Andrew Yourtchecko, Erik Kline

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