           Use Cases for Multiple Provisioning Domain in Homenet
                   draft-geng-homenet-mpvd-use-cases-02

Abstract

   This document describes the use cases of multiple provisioning domain
   (MPVD) in homenet. Although most residential networks nowadays are
   connected to a single ISP and normally subscribed to standard
   internet service, it is expected that much wider range of devices and
   services will become common in home networks. Homenet defines such
   home network topologies with increasing number of devices with the
   assumption that it requires minimum configuration by residential
   user. As described in the homenet architecture ([RFC7368]),
   multihoming and multi-service residential network will be more common
   in the near future. Nodes in such network may commonly have multiple
   interfaces or subscribe to multiple services. Potential types of
   PVD-aware nodes concerning interface and service specific
   provisioning domains are introduced in this document. Based on this,
   different MPVD configuration examples are given. These examples
   illustrate how PVD may be implemented in home network. PVDs provide
   independent provisioning domains for different interfaces and
   services, which enables robust and flexible network configuration for
   these networks.

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   material or to cite them other than as "work in progress."

   This Internet-Draft will expire on April 18, 2016.

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1. Introduction

   It is believed that future residential network will more commonly be
   multihomed, which potentially provides either resilience or more
   flexible services. At the same time, more internal routing and
   multiple subnets are expected to commonly exist in such networks.
   For example, customer may want independent subnets for private and
   guest usages. Homenet describes such future home network involving
   multiple routers and subnets ([RFC7368]).

Multihoming and the increasing number of subnets bring challenges on provisioning of the network. As stated in [RFC6418], such multihomed scenarios with nodes attached to multiple upstream networks may experience configuration conflicts, leading to a number of problems. To deal with these problem, draft-ietf-mif-mpvd-arch-10 provides a framework which introduces Provisioning Domain (PvD), which associates a certain interface and its related network configuration information. Hence, corresponding network configuration can be used when packets are delivered through a particular interface.

This document focuses on the MPvD use cases in residential network, particularly the IPV6-based homenet. Based on the homenet topology, use cases of MPvD in homenet are described for both singlehomed and multihomed network configurations.

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 RFC 2119 [RFC2119].

2. Terminology and Abbreviations

The terminology and abbreviations used in this document are defined in this section.

o ISP: Internet Service Provider. A traditional network operator who provides internet access to customers.

3. Homenet with Multiple PvDs

In the most common multihoming scenarios, the home network has multiple physical connections to the ISP networks. Section 3.2.2.2 and 3.2.2.3 in [RFC7368] give the topology examples of such homenet. In the examples, homenet hosts are connected to a single or multiple customer edge routers (CE router), the CE routers are then connected to separate ISP networks. For the particular topology with a single CE router given in Section 3.2.2.3 in [RFC7368], the CE router is a mif node since it has two interfaces connected to individual service provider routers. Given that the CE router is a PvD-aware node, it may have two PvDs provided by ISPs respectively.

Apart from the multihoming resulted from physical connections , PvDs in Homenet can also be used for service provisioning. For example, a host may subscribe one ISP for internet service, whilst subscribe to another ISP for Internet of Things (IoT) service given that the CE router have access to both ISPs. On the other hand, the host user may also subscribe to the same ISP for both services. In either

case, PvDs can be used for customized network configurations
purposes. This enables the service providers to provide independent
and flexible provisioning for different services. Meanwhile, IoT
service providers may also want to use independent PvDs to avoid the
configuration conflicts between each other as stated in RFC6418.

A typical example of a PvD in home network is the one associating
corresponding network configuration with an HNCP routers. These
includes both CE router and interior router in Homenet. As described
in ([RFC7368]), an CE router in homenet may have one or more external
interfaces with ISPs and internal interfaces with interior routers.
For external interfaces, the CE router can receive associated PvD
information from corresponding ISPs. For interior interfaces, the
interior router can receive PvD information from connected CE router
or other interior routers.

Hosts in homenet are expected to be multihomed as well. Hence, PvD
may also be used in such cases to associate different network
configurations. In this case, the PvD information is received from
the HNCP router a host is attached to, either a CE router or a
interior router.

4. Examples of MPvD Configurations in Home Network

This section gives some examples of MPvD configurations in home
network.

4.1. Single CE Router Connected to Single ISP with interior router

```
                              <----"Internet" PvD----------->
                                 _____
                      +-------+      (     )
        +--------+    |       |    (  ISP  )     +------+
        |   PC   +------+     +-------------------+ WWW  |
        +--------+    | HNCP | (              )   +------+
                      |  CE  | (              )
        +--------+    |Router| (            )     +------+
        | SETBOX +------+     +-------------------+ VOD  |
        +--------+    |       |  (            )   +------+
                      |       | (            )
                      |  <----"VOD"  PvD--------------->
                      |     | (              )
         <-----------------"VPN" PvD ----------------------->
     +--------+       |     | (              )
     | +----+ | +--------+  |     | (            )    +------+
     | |VPN +---+       |   |     | (            )    + VPN  |
     | +----+ | |Interior|  |     +-------------------+      +------+
     | Host 3 | |  HNCP  +------+       |   (          )
     | +----+ | | Router |  |       |   (        )
     | |IoT +---+       |   |       |   (       __)     +------+
     | +----+ | +--------+  |       +-------------------+ IoT  |
     +--------+   +-------+      (__ )           +------+
        <-----------------"IoT" PvD-------------------------->
```

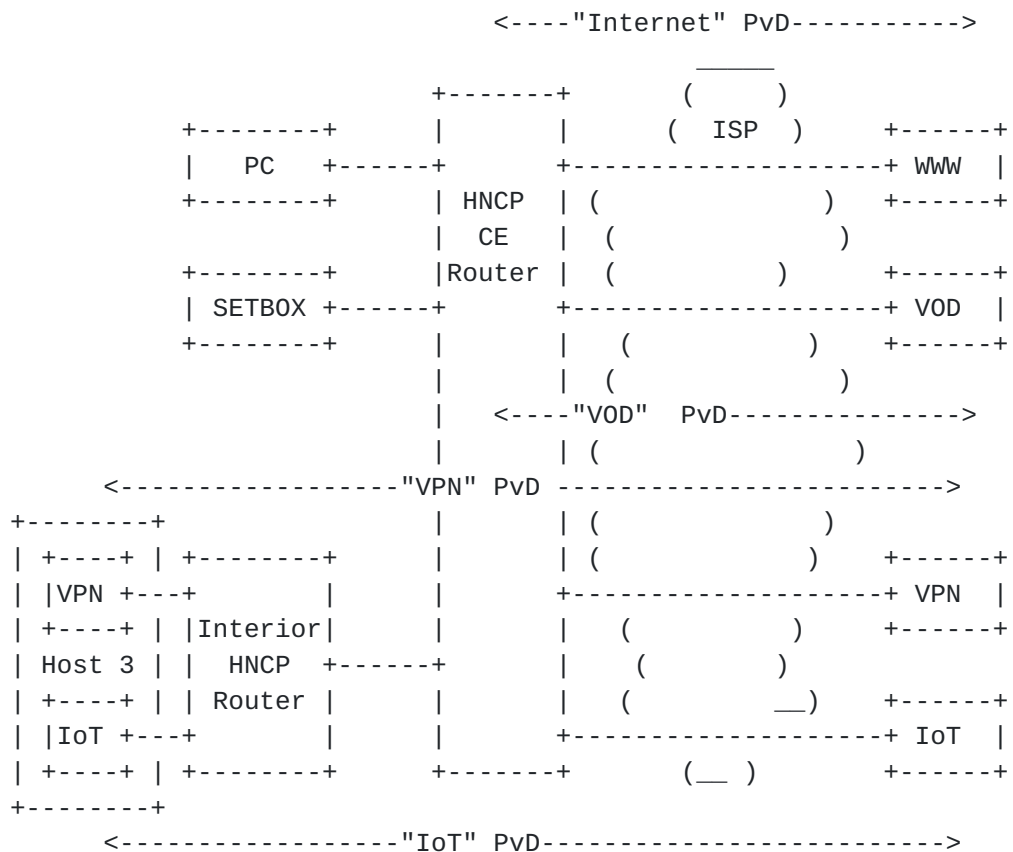   Figure 1

   In this example, A homenet is connected with a single ISP as seen in
   Figure 1. Four different services are provided to this home network
   including Internet, VOD, VPN and IoT. There are 3 Hosts in this set-
   up. PC and setbox use "Internet" and "VoD" PvDs respectively and
   Host 3 uses both "VPN" and "IoT" PvD.

   The four PVDs could be either implicit or explicit PvDs. Explicit
   PvDs should be initially assigned to HNCP CE router by ISP. And then
   forwarded to interior routers and host. Given that all PvDs are
   explicit in the case above, the "Internet" PvD is forwarded to PC and
   "VOD" PvD to SETBOX by the CE router, and the "VPN" and "IoT" PvDs
   are forwarded to interior HNCP router and then Host 3. The PvD_ID
   should be kept the same when the PvDs are forwarded. However, other
   associated network configuration (i.e. delegated prefixes) should be
   changed accordingly.

4.2. **Two CE Routers Connected to two ISPs with Shared Subnets**

   To be added

4.3. **One CE Routers Connected to two ISPs with Shared Subnets**

   To be added

5. **PvD-aware node in homenet**

   As defined in MIF, "PvD-aware node is a a node that supports the
   association of network configuration information into PvDs and the
   use of these PvDs to serve requests for network connections". In
   Homenet, the HNCP CE router, interior router and host are all PvD-
   aware nodes.

   The HNCP CE router PvD-related functionality is define as follows:

   o Generates implicit PvDs for different uplink interfaces.

   o Requests and receives all explicit PvDs provided by the connected
      ISPs.

   o Generates explicit PvDs for interior routers and hosts referring
      to the ISP-provided PvDs and forwards them accordingly.

   o Creates and stores the PvD mapping between the PvD applied itself
      the the one forwarded to interior routers and hosts using the
      assigned PvD_ID and prefix.

   o Identify the prefix received from homenet nodes and performs PvD
      selection based on PvD mapping.

   The interior router PvD-related functionality is defined as follows:

   o Generates implicit PvDs for different homenet internal interface.

   o Requests and receives all explicit PvDs provided by connected
      homenet routers.

   o Generates explicit PvDs for interior routers and hosts referring
      to the homenet-router-provided PvDs and forwards them accordingly.

   o Creates and stores the PvD mapping between the PvD applied itself
      the the one forwarded to interior routers and hosts using the
      assigned PvD_ID and prefix.

o Identify the prefix received from homenet nodes and performs PvD
   selection based on PvD mapping.

The host PvD-related functionality is defined as follows:

o Generates implicit PvDs for different interfaces between host and
   homenet routers.

o Requests and receives all explicit PvDs provided by connected
   homenet routers.

6. IPv4 compatibility

PvD in homenet can be either single-family or dual-stack. For
single-family PvD, the IPV4 and IPV6 configurations should be managed
in separate PvDs with different PvD identities. For Dual-stack PvDs,
IPV4 and IPV6 configurations can exist in the same PvD. In both
cases, there can either be only one IPV4 PvD for each interface or
multiple IPV4 PvDs with different default gateway addresses.

7. Conveying PvD information

At the time this document was written, the conveying of PvD
information was still under discussion in mif working group. Popular
choices include DNS, DHCP and Route Advertisement. For PvD
information provided from ISP to CE router and router to host, the
approaches for PvD information delivery defined by mif may be
directly used. For PvD information delivery within homenet between
HNCP-enabled routers, HNCP-based approach need to be defined. The
detail of how homenet could support the delivery of PvD information
between routers is subjected to further discussions and will be
addressed in a separate document.

8. Acknowledgements

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Stenberg and Steven Barth for valuable discussions and contributions
to this document.

9. IANA Considerations

This memo includes no request to IANA.

10. Security Considerations

TBA

11. References

11.1. Normative References

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