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Use Cases for Multiple Provisioning Domain in Homenet
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Abstract

This document describes the use cases of multiple provisioning domain (MPVD) in homenet. As homenet makes multihoming and multi-subnet a norm in future residential networks, nodes with multiple interface or connected to multiple services may commonly exist in homenet. MPVD may provide independent provisioning domains for different interfaces and services, which enables robust and flexible network configuration for such multi-interface/service nodes.

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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 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 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 residential network.

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.
- o OSP: Over-the-top Service Provider. An organization who provides over-the-top services including but not limited to Internet of Things.

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 a single PvD as it is connected to only one ISP and an additional PvD if connected to both.

Apart from the multihoming resulted from physical connections to different ISPs, the future residential network may also logically connected to multiple service providers(i.e. Over-the-top service providers), who do not directly provide access service to customers. For example, one customer may subscribe to a traditional service ISP for basic internet service, whilst subscribe to other providers for Internet of Things service. The latter are likely to be OSPs as defined in [Section 2](#) of this document, who are not bounded to any of the ISPs providing basic access service for the residential network. In this case, a particular OSP providing multiple services may use multiple PvDs for network configurations purposes. This enables independent and flexible provisioning between different services provided to customers. Meanwhile, different OSPs may also want to use independent PvDs to avoid the configuration conflicts issues stated in [RFC6418](#).

The following sections outline the possible types of PvD-aware nodes in homenet.

3.1. PvD-aware Node with multiple interfaces

One example of a PvD-aware node with multiple interfaces may be a multihomed CE router connected to multiple ISPs. Hence, it consists of multiple interfaces and each ISP may deliver PvD information through its own interface. Then the CE router associates network configuration of one particular ISP with the corresponding PvD.

3.2. PvD-aware Node with multiple services

A PvD-aware node with multiple services may be a device subscribing to multiple services provided by ISPs and OSPs. However, it does not necessarily have multiple interfaces. The characteristic of independent services provided to a single device make it very similar to a node connected to multiple interfaces, given that each service can be seen as an independent interface. OSPs may deliver PvD information to the devices according to specific services that a customer subscribes.

A good example of such node is a box provided by OSP. This box may be connected to a CE router as an interior router as demonstrated in [section 3.2.2.1 of \[RFC7368\]](#), or integrated in the CE router in some circumstances. It may also be a general host in homenet, either connected directly to a CE router or an interior router.

3.3. Hybrid PvD-aware Node

The coexistence of multiple interfaces and services is possible when a CE router is both multihomed with more than one ISPs and accessible by the OSPs for service-specific network configurations. In this case, the CE router acts as a Hybrid PvD-aware node since it may receive PvD information associated to interfaces and services from individual sources respectively. Given that such PvDs are managed by ISPs and OSPs separately, it is suggested that PvDs from different sources should work independently to provide full flexibility. However, certain arrangement could be made between ISPs and OSPs for the purpose of delivering the best quality of services (i.e. configuration of a default PvD from a particular ISP for a certain OSP service).

Hybrid node may also be a host in homenet, which intrinsically has multiple interfaces and have access to multiple services. Some examples include a mobile device with Wifi, Bluetooth and cellular connections, which at the same time subscribes to multiple services from OSP(s). This is quite similar to the example given in

Section 4.1 of [draft-ietf-mif-mpvd-arch-10](#), with an expansion of introducing OSPs for the conveying of service-specific PvDs.

4. Examples of MPvD Configurations in Home Network

This section gives some examples of MPvD configurations in home network according to the types of PvD-aware nodes defined in [Section 3](#)

4.1. Homenet Connected to a Single ISP

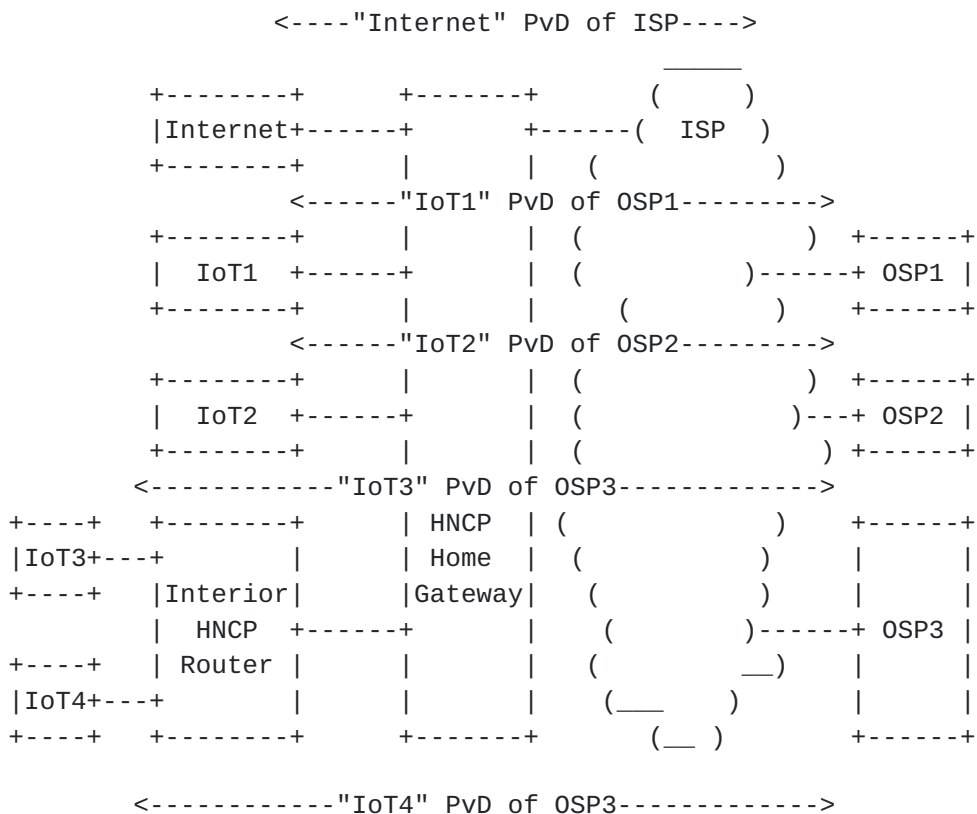


Figure 1

A homnet home gateway (CE router) is singlehomed with only one ISP as seen in Figure 1. In this scenario, basic internet service is provided by a single ISP, IoT services are provided by 3 different OSPs. Multiple PvDs are created in the homenet for the purpose of service provisioning. The home gateway, connected with multiple service providers, may receive basic internet PvD information from the connected ISP, IoT1 PvD information from OSP1 and IoT2 PvD information from OSP2. An HNCP-enabled interior router is connected to the home gateway, acting as a service box for OSP 3. Given that

the customer subscribes to multiple services provided by OSP 3, multiple PvDs may be created for the interior HNCP router.

4.2. Multihomed Homenet

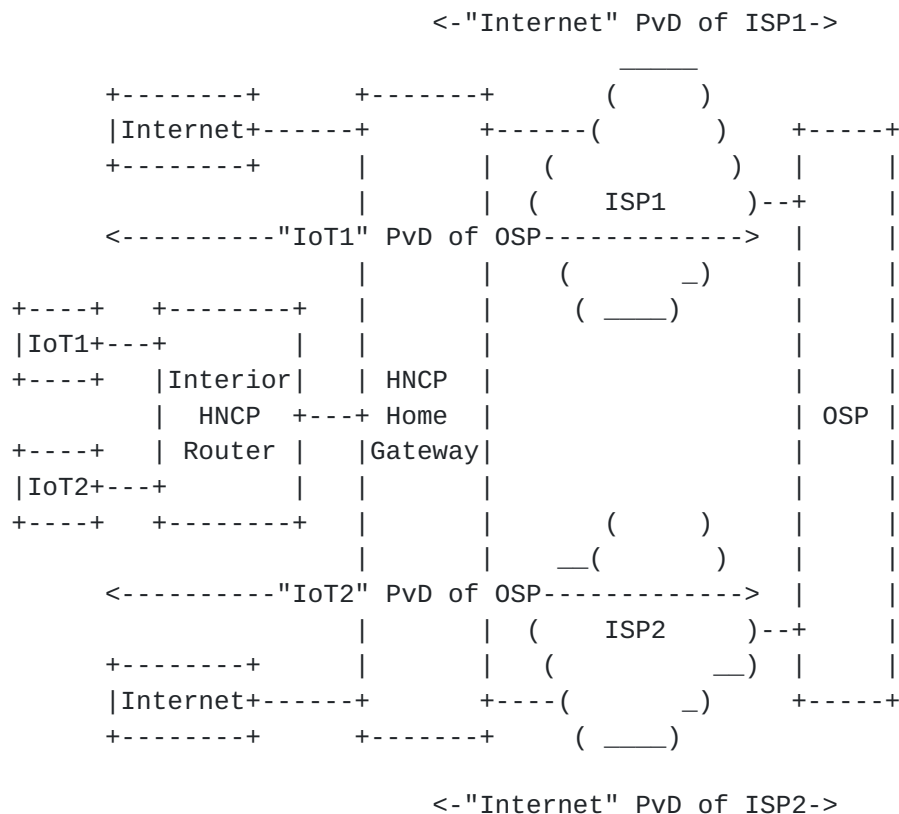


Figure 2

Figure 2 illustrates an example of multihomed homenet with multiple PvDs. Two ISPs are connected with the HNCP home gateway. In this example, the home gateway is a Hybrid PvD-aware node since it creates PvDs for both ISP interfaces and OSP services. Similarly to the previous example, an interior HNCP router is connected to the home gateway and receives PvD information from the OSP.

5. Conveying PvD information

The PvD associated with a OSP service may be provided by the the ISPs in which the OSP is homed, or directly provided by OSP using application layer approach. Since OSP is normally homed with multiple ISPs, a PvD-aware node in multihomed homenet may receive PvD information from different ISP interfaces for a certain OSP service. It is subjected to the OSP to decide whether to provide multiple ISP-

specific PVD for each service. Given that an ISP-specific PVD is provided, the association between the PVD and the targeted ISP interface need to be taken care of to avoid potential link failure.

At the time this document was written, the conveying of PVD information was still under discussion in mif working group. Popular choices include DHCP and Route Advertisement. For PVD information provided from ISPs and OSPs to home gateways and from the home gateways to homenet hosts, the approaches for PVD information delivery defined by mif may be directly used.

For PVD information delivery within homenet between HNCP-enabled routers, HNCP may be used. A PVD option TLV can be created for the encapsulation of the HNCP-defined TLVs and PVD Identity to associate the corresponding Pvd and network configurations. The detail of how HNCP could support this is subjected to further discussions and may be addressed in this document in future updates.

6. Acknowledgements

The author would like to thank Ted Lemon for valuable initial discussions of this document.

7. IANA Considerations

This memo includes no request to IANA.

8. Security Considerations

TBA

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9.1. Normative References

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