

Internet Engineering Task Force
Internet-Draft
Intended status: Standards Track
Expires: January 16, 2014

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**DHCPv6 class based prefix
draft-bhandari-dhc-class-based-prefix-05**

Abstract

This document introduces options to communicate property and associate meta data with prefixes. It extends DHCPv6 prefix delegation and address allocation using the meta data for selection of prefixes and addresses.

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1. Introduction

In IPv6 a network interface can acquire multiple addresses from the same scope. In such a multi-prefix network each of the multiple prefixes can have a specific property and purpose associated with it. Example: In a mobile network a mobile device can be assigned a prefix from its home network and another from the visiting network that it is attached to. Another example is a prefix may provide free Internet access without offering any quality of service guarantees while another prefix may be charged along with providing quality of service guarantees for network service access. A prefix can have well defined properties that is universal and have a meta data associated with it that communicates its local significance. The properties and meta data of prefix will be relevant for prefix delegation, source address selection as elaborated in the subsequent sections.

This document defines OPTION_PREFIX_PROPERTY option that communicates property of the prefix that is universally understood. This document defines OPTION_PREFIX_CLASS option to communicate meta data of the prefix that communicates the prefix's local significance.

This document discusses usage of OPTION_PREFIX_CLASS to request and select prefixes with specific meta data via IA_PD and IA_NA as defined in [[RFC3633](#)] and [[RFC3315](#)] respectively. This document defines the behavior of the DHCPv6 server, the DHCPv6 prefix requesting router and the DHCPv6 client to use OPTION_PREFIX_CLASS option for requesting and selecting prefixes and addresses.

The network address can be configured via DHCPv6 as defined in [[RFC3315](#)] or via Stateless Address Autoconfiguration (SLAAC) as defined in [[RFC4862](#)], additional information of a prefix can be provided via DHCPv6 or via IPv6 Router Advertisement (RA). The information provided in the options defined in this document OPTION_PREFIX_PROPERTY and OPTION_PREFIX_CLASS can be used for source address selection. Communicated property and meta data information about the prefix via IPv6 Router Advertisement (RA) will be dealt with in separate document [[I-D.korhonen-6man-prefix-properties](#)].

1.1. Motivation

In this section motivation for class based prefix delegation that qualifies the delegated prefix with additional class information is described in the context of mobile networks and home networks. The property information attached to a delegated prefix helps to distinguish a delegated IPv6 prefix and selection of the prefix by different applications using it.

1.1.1. Mobile networks

In the mobile network architecture, there is a mobile router which functions as a IP network gateway and provides IP connectivity to mobile nodes. Mobile router can be the requesting router requesting delegated IPv6 prefix using DHCPv6. Mobile router can assume the role of DHCPv6 server for mobile nodes(DHCPv6 clients) attached to it. A mobile node in mobile network architecture can be associated with multiple IPv6 prefixes belonging to different domains for e.g. home address prefix, care of address prefix as specified in [[RFC3775](#)].

The delegated prefixes when seen from the mobile router perspective appear to be like any other prefix, but each prefixes have different meta data referred to as "Prefix Color" in the mobile networks. Some delegated prefixes may be topologically local and some may be remote prefixes anchored on a global anchor, but available to the local anchor by means of tunnel setup in the network between the local and global anchor. Some may be local with low latency characteristics suitable for voice call break-out, some may have global mobility support. So, the prefixes have different properties and it is required for the application using the prefix to learn about this property in order to use it intelligently. There is currently no semantics in DHCPv6 prefix delegation that can carry this information to specify properties of a delegated prefix. In this scenario, the mobile router is unable to further delegate a longer prefix intelligently based on properties of the prefix learnt. Neither is a mobile device able to learn about the property of the prefix assigned to influence source address selection. Example to determine if the prefix is a home address or care of address.

1.1.2. Home networks

In a fixed network environment, the homenet CPE may also function as both a DHCPv6 client (requesting the IA_PD(s)) and a DHCPv6 server allocating prefixes from delegated prefix(es) to downstream home network hosts. Some service providers may wish to delegate multiple prefixes to the CPE for use by different services classes and traffic types.

Motivations for this include:

- o Using source prefix to identify the service class / traffic type that is being transported. The source prefix may then reliably be used as a parameter for differentiated services or other purposes. E.g. [[I-D.jiang-v6ops-semantic-prefix](#)]

- o Using the specific source prefix as a host identifier for other services. E.g. as an input parameter to a DHCPv4 over IPv6 server [[I-D.ietf-dhc-dhcpv4-over-ipv6](#)]

To meet these requirements, when the CPE (functioning as a DHCPv6 server) receives an IA_NA or IA_TA request from a homenet host, a mechanism is required so that the correct prefix for requested service class can be selected for allocation. Likewise for DHCPv6 clients located in the homenet, a mechanism is necessary so that the intended service class for a requested prefix can be signalled to the DHCPv6 server.

1.2. Terminology

This document uses the terminology defined in [[RFC2460](#)], [[RFC3315](#)] and [[RFC3633](#)].

1.3. Requirements Language

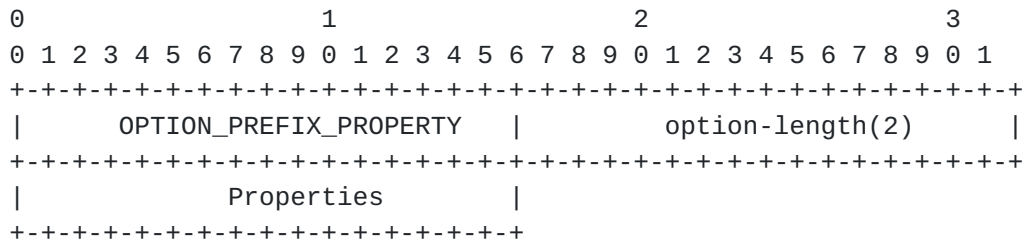
The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC 2119](#) [[RFC2119](#)].

2. Overview

This section defines prefix property and prefix class options in IA_PD and IA_NA. This section defines the behavior of the delegating router, the requesting router and the DHCPv6 client. It discusses these options in the context of a DHCPv6 information request from a DHCPv6 client to a DHCPv6 server.

2.1. Prefix Property and Class Options

The format of the DHCPv6 prefix property and prefix class options are shown below.



```

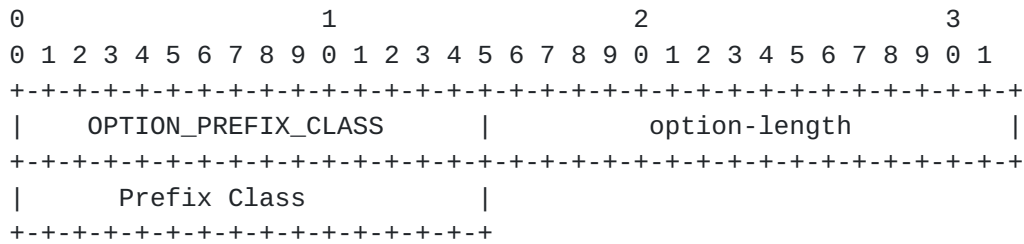
option-code:      OPTION_PREFIX_PROPERTY (TBD1)
option-length:    2
Properties:       16 bits maintained as
                  OPTION_PREFIX_PROPERTY in
                  IANA registered namespace.
                  Each value in the registry represents a property.
                  Multiple properties can be represented by bitwise
                  ORing of the individual property values in this
                  field.

```

Prefix Property Option

The individual property are maintained in OPTION_PREFIX_PROPERTY values enumeration explained in Section [Section 6.1](#).

Along with the OPTION_PREFIX_PROPERTY a meta data associated with the prefix that is of local relevance is communicated using OPTION_PREFIX_CLASS defined below:



```

option-code:      OPTION_PREFIX_CLASS (TBD2)
option-length:    2
Prefix Class:     16 bit integer with the integer value
                  of local significance.

```

Prefix Class Option

[2.2.](#) Consideration for different DHCPv6 entities

The model of operation of communicating prefixes to be used by a DHCPv6 server is as follows. A requesting router requests prefix(es) from the delegating router, as described in [Section 2.2.1](#). A delegating router is provided IPv6 prefixes to be delegated to the requesting router. Examples of ways in which the delegating router is provided these prefixes are:

- o Configuration
- o Prefix delegated via a DHCPv6 request to another DHCPv6 server
- o Using a Authentication Authorization Accounting (AAA) protocol like RADIUS [[RFC2865](#)]

The delegating router chooses prefix(es) for delegation, and responds with prefix(es) to the requesting router along with additional options in the allocated prefix as described in [Section 2.2.2](#). The requesting router is then responsible for the delegated prefix(es) after the DHCPv6 REQUEST message exchange. For example, the requesting router may create DHCPv6 server configuration pools from the delegated prefix, and function as a DHCPv6 Server. When the requesting router then receives a DHCPv6 IA_NA requests it can select the address to be allocated based on the OPTION_PREFIX_CLASS option received in IA_NA request or any of the other method as described in [Section 2.3.1](#).

2.2.1. Requesting Router Behavior for IA_PD allocation

DHCPv6 requesting router can request for prefixes in the following ways:

- o In the SOLICIT message within the IA_PD Prefix option, it MAY include OPTION_PREFIX_CLASS requesting prefix delegation for the specific class indicated in the OPTION_PREFIX_CLASS option. It can include multiple IA_PD Prefix options to indicate it's preference for more than one prefix class. The class of prefix it requests is learnt via configuration or any other out of band mechanism not defined in this document.
- o In the SOLICIT message include an OPTION_ORO option with the OPTION_PREFIX_CLASS option code to request prefixes from all the classes that the DHCPv6 server can provide to this requesting Router.

The requesting router parses the `OPTION_PREFIX_CLASS` option in the `OPTION_IAPREFIX` option area of the corresponding `IA_PD` Prefix option in the `ADVERTISE` message. The Requesting router **MUST** then include all or subset of the received class based prefix(es) in the `REQUEST` message so that it will be responsible for the prefixes selected.

The requesting router parses and stores `OPTION_PREFIX_PROPERTY` if received with the prefix.

2.2.2. Delegating Router Behavior for `IA_PD` allocation

If the Delegating router supports class based prefix allocation by supporting the `OPTION_PREFIX_CLASS` option and it is configured to assign prefixes from different classes, it selects prefixes for class based prefix allocation in the following way:

- o If requesting router includes `OPTION_PREFIX_CLASS` within the `IA_PD` Prefix option, it selects prefixes to be offered from that specific class.
- o If requesting router includes `OPTION_PREFIX_CLASS` within `OPTION_ORO`, then based on its configuration and policy it **MAY** offer prefixes from multiple classes available.

The delegating router responds with an `ADVERTISE` message after populating the `IP_PD` option with prefixes from different classes. Along with including the `IA_PD` prefix options in the `IA_PD` option, it **MAY** include the `OPTION_PREFIX_CLASS` option in the `OPTION_IAPREFIX` option area of the corresponding `IA_PD` prefix option with the class information of the prefix.

If neither the `OPTION_ORO` nor the `IA_PD` option in the `SOLICIT` message include the `OPTION_PREFIX_CLASS` option, then the delegating router **MAY** allocate the prefix as specified in [[RFC3633](#)] without including the class option in the `IA_PD` prefix option in the response.

If `OPTION_ORO` option in the `Solicit` message includes the `OPTION_PREFIX_CLASS` option code but the delegating router does not support the solution described in this specification, then the delegating router acts as specified in [[RFC3633](#)]. The requesting router **MUST** in this case also fall back to the behavior specified in [[RFC3633](#)].

If both delegating and requesting routers support class-based prefix allocation, but the delegating router cannot offer prefixes for any other reason, it MUST respond to requesting router with appropriate status code as specified in [[RFC3633](#)]. For e.g., if no prefixes are available in the specified class then the delegating router MUST include the status code NoPrefixAvail in the response message.

In addition if the delegating router has additional property associated with the prefix it will be provided in OPTION_PREFIX_PROPERTY option.

2.2.3. DHCPv6 Client Behavior for IA_NA allocation

DHCPv6 client MAY request for an IA_NA address allocation from a specific prefix class in the following way:

- o In the SOLICIT message within the IA_NA option, it MAY include the OPTION_PREFIX_CLASS requesting address to be allocated from a specific class indicated in that option. The class information to be requested can be learnt via configuration or any other out of band mechanism not described in this document.

If DHCPv6 client receives OPTION_PREFIX_CLASS, OPTION_PREFIX_PROPERTY options in the IAaddr-options area of the corresponding IA_NA but does not support one or both of these options, it SHOULD ignore the received option(s).

2.2.4. DHCPv6 Server Behavior for IA_NA allocation

The DHCPv6 server parses OPTION_PREFIX_CLASS option received and when it supports allocation within the requested OPTION_PREFIX_CLASS responds with an ADVERTISE message after populating the IA_NA option with address information from the requested prefix class. Along with including the IA Address options in the IA_NA option, it also includes the OPTION_PREFIX_CLASS option in the corresponding IAaddr-options area.

Even though the IA_NA option in the SOLICIT message does not include the OPTION_PREFIX_CLASS option, based on local policies, the DHCP server MAY select a default OPTION_PREFIX_CLASS value for the client and then SHOULD include the OPTION_PREFIX_CLASS option in the IAaddr-options area of the corresponding IA_NA it sends to the client. If both DHCP client and server support class based address allocation, but the DHCP server cannot offer addresses in the specified Usage class then the DHCP server MUST include the status code NoAddrsAvail (as defined in [[RFC3315](#)]) in the response message. If the DHCP server cannot offer addresses for any other reason, it MUST respond to client with appropriate status code as specified in [[RFC3315](#)]. In

addition if the server has additional property associated with the prefix by means of configuration or learnt from DHCPv6 prefix delegation or derived via any other means it MUST be sent as OPTION_PREFIX_PROPERTY option.

2.3. Usage

Class based prefix delegation can be used by the requesting router to configure itself as a DHCPv6 server to serve its DHCPv6 clients. It can allocate longer prefixes from a delegated shorter prefix it received, for serving IA_NA and IA_PD requests. Prefix property and class can be used for source address selection by applications using the prefix for communication.

2.3.1. Class based prefix and IA_NA allocation

The requesting router can use the delegated prefix(es) from different classes (for example "video" (1), "guest"(2), "voice" (3) etc), for assigning the IPv6 addresses to the end hosts through DHCPv6 IA_NA based on a preconfigured mapping with OPTION_PREFIX_CLASS option, the following conditions MAY be observed:

- o It MAY have a pre-configured mapping between the prefix class and OPTION_USER_CLASS option received in IA_NA.
- o It MAY match the OPTION_PREFIX_CLASS if the IA_NA request received contains OPTION_PREFIX_CLASS.
- o It MAY have a pre-configured mapping between the prefix class and the client DUID received in DHCPv6 message.
- o It MAY have a pre-configured mapping between the prefix class and its network interface on which the IA_NA request was received.

The requesting router playing the role of a DHCPv6 server can ADVERTISE IA_NA from a class of prefix(es) thus selected.

2.3.2. Class based prefix and IA_PD allocation

If the requesting router, receives prefix(es) for different classes (for example "video"(1), "guest"(2), "voice"(3) etc), it can use these prefix(es) for assigning the longer IPv6 prefixes to requesting routers it serves through DHCPv6 IA_PD by assuming the role of delegating router, its behavior is explained in [Section 2.2.2](#).

2.3.3. Class based prefix and SLAAC

DHCPv6 IA_NA and IPv6 Stateless Address Autoconfiguration (SLAAC as defined in [[RFC4862](#)]) are two ways by IPv6 addresses can be dynamically assigned to end hosts. Making SLAAC class aware is outside the scope of this document, it is specified in [[I-D.korhonen-6man-prefix-properties](#)].

2.3.4. Class based prefix and applications

Applications within a host can do source address selection based on the class of the prefix learnt in OPTION_PREFIX_PROPERTY and OPTION_PREFIX_CLASS using rules defined in [[RFC6724](#)]. The internal data structure and interface for source address selection used by application to choose source prefix with specific property and class in a host is beyond the scope of this document.

3. Example Application

3.1. Mobile gateway example

The following sub-sections provide examples of class based prefix delegation and how it is used in a mobile network. Each of the examples will refer to the below network:

The example network consists of :

Mobile Gateway It is network entity anchoring IP traffic in the mobile core network. This entity allocates an IP address which is topologically valid in the mobile network and may act as a mobility anchor if handover between mobile and Wi-Fi is supported.

Mobile Nodes (MN) A host or router that changes its point of attachment from one network or subnetwork to another. A mobile node may change its location without changing its IP address; it may continue to communicate with other Internet nodes at any location using its (constant) IP address, assuming link-layer connectivity to a point of attachment is available.

Access Point (AP) A wireless access point, identified by a MAC address, providing service to the wired network for wireless nodes.

Access Router (AR) An IP router residing in an access network and connected to one or more Access Point(AP)s. An AR offers IP connectivity to MNs.

WLAN controller (WLC) The entity that provides the centralized forwarding, routing function for the user traffic.

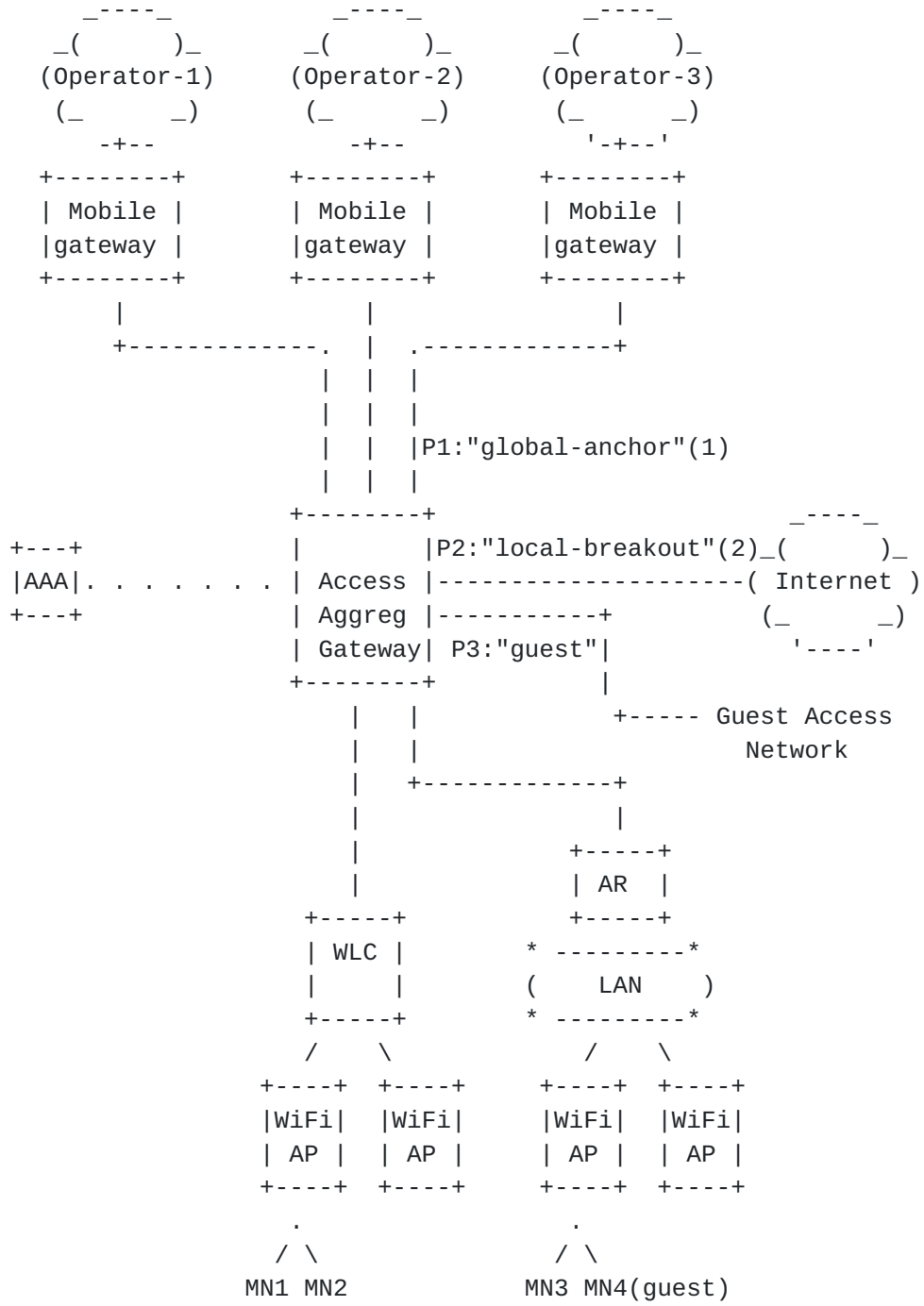


Figure 1: Example mobile network

3.1.1. Class based prefix delegation

The Access Aggregation Gateway requests for Prefix delegation from Mobile gateway and associates the prefix received with class "global-anchor"(1). The Access Aggregation Gateway is preconfigured to provide prefixes from the following classes: "global-anchor" (1), "local-breakout"(2), "guest"(3). It has a preconfigured policy to advertise prefixes to requesting routers and mobile nodes based on the service class supported by the service provider for the requesting device. In the example mobile network, the Access Router(AR) requests class based prefix allocation by sending a DHCPv6 SOLICIT message and include OPTION_PREFIX_CLASS in the OPTION_ORO.

The Access Router (AR) receives an advertise with following prefixes in the IA_PD option:

1. P1: IA_PD Prefix option with a prefix 3001:1::/64 containing OPTION_PREFIX_CLASS set to "global-anchor"(1)
2. P2: IA_PD Prefix option with a prefix 3001:2::/64 containing OPTION_PREFIX_CLASS set to "local-breakout"(2)
3. P3: IA_PD Prefix option with a prefix 3001:3::/64 containing OPTION_PREFIX_CLASS set to "guest"(3)

It sends a REQUEST message with all of above prefixes and receives a REPLY message with prefixes allocated for each of the requested class.

3.1.2. IPv6 address assignment from class based prefix

When the Access Router(AR) receives a DHCPv6 SOLICIT requesting IA_NA from the mobile node that has mobility service enabled, it offers an IPv6 address from the prefix class "global-anchor"(1). For MN3 it advertises 3001:1::1 as the IPv6 address in OPTION_IAADDR in response to the IA_NA request.

The Mobile Node(MN4) Figure 1 sends a DHCPv6 SOLICIT message requesting IA_NA address assignment with OPTION_USER_CLASS option containing the value "guest" towards the CPE. The Access Router(AR) assumes the role of the DHCPv6 server and sends an ADVERTISE to the MN with OPTION_IA_NA containing an IPv6 address in OPTION_IAADDR from the "guest"(3) class. The IPv6 address in the OPTION_IAADDR is set to 3001:3::1. The "guest" class can also be distinguished based on a preconfigured interface or SSID advertised for MNs connecting to it.

When the Access Aggregation Gateway receives a DHCPv6 SOLICIT requesting IA_NA from MNS through WLC and it has a preconfigured

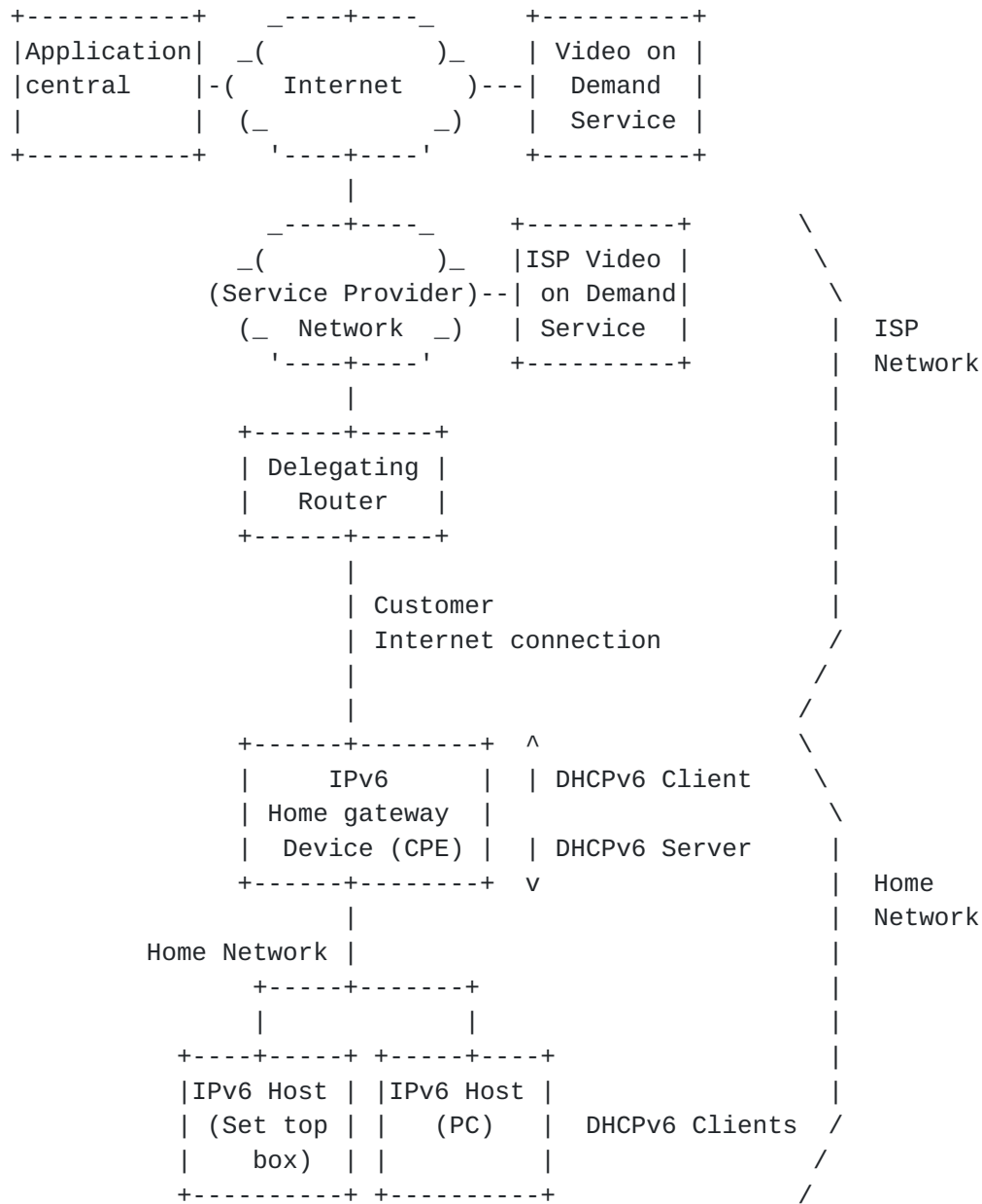
profile to provide both local-breakout Internet access and global-anchor, it offers an IPv6 address from the class "local-breakout" (2) and "global-anchor"(1). For MN1 it advertises 3001:2::1 and 3001:1::2 as the IPv6 address in OPTION_IAADDR in response to the IA_NA request. Applications within MN1 can choose to use the appropriate prefix based on the mobility enabled or local-breakout property attached to the prefix based on source address selection policy.

The prefixes that are globally anchored and hence have mobility can be advertised with OPTION_PREFIX_PROPERTY set to 0x0002 to convey that the prefix provides network based mobility as listed in [Section 6.1](#). If the prefix also provides security guarantees OPTION_PREFIX_PROPERTY can be set to 0x000A to indicate mobility and security guarantees by bitwise ORing of both the properties.

[3.2.](#) Homenet Example

The following sub-section describes an example of class based prefix delegation in a home network environment. The network consists of the following elements:

- o Home Gateway (HGW) device: a routing device located in the customer's premises that provides connectivity between the customer and the service provider. In this example, the HGW is functioning as both a DHCP client towards the service provider's DHCP infrastructure and a DHCP server towards hosts located in the home network.
- o IPv6 Set Top Box (STB): A dedicated, IPv6 attached, video on demand device.
- o IPv6 PC: An IPv6 attached personal computer
- o Delegating Router: The router in the ISPs network acting as a DHCP server for the IA_PD request.
- o ISP Video On Demand (ISP-VOD) service: An ISP provided service offering unicast based streaming video content to subscribers.
- o Video On Demand (VOD) service: A server providing unicast based streaming video content to subscribers
- o On demand Video Application: Application hosted on the IPv6 PC
- o Application Central: Application server hosted in the Internet that the On demand Video Application communicates with to access VOD service



Simple home network with Data and Video devices

3.2.1. Class based prefix delegation to the HGW

In this example, three different services are being run on the same network. The service provider wishes that traffic is sourced from different prefixes by the home network clients [[I-D.jiang-v6ops-semantic-prefix](#)]. The HGW (requesting router) has been configured to request prefix delegation from the ISPs delegating router with the usage classes "video" (1) and "internet"(2) and "video-app" (3) the meaning of these being of relevance to the ISP

operating this and application that are configured out of band to utilize it.

The delegating router is preconfigured to advertise prefixes with these service classes. The HGW sends three IA_PD options within the SOLICIT message, one with OPTION_PREFIX_CLASS "video" (1), the second with "internet" (2) and a third with "video-app" (3). The HGW receives an advertise with the following prefixes in the IA_PD option:

1. P1: IA_PD Prefix option with a prefix 3001:5::/56 containing OPTION_PREFIX_CLASS set to "video" (1) with OPTION_PREFIX_PROPERTY set to 0x0001 indicating there is no internet reach
2. P2: IP_PD Prefix option with a prefix 3001:6::/56 containing OPTION_PREFIX_CLASS set to "internet" (2)
3. P3: IP_PD Prefix option with a prefix 3001:7::/56 containing OPTION_PREFIX_CLASS set to "video-app" (3) with property set to 0x0040 indicating the prefix provides Internet service SLA

It sends a REQUEST message with all of the above prefixes and receives a REPLY message with prefixes allocated for each of the requested classes. The HGW then configures a /64 prefix from each of the delegated prefixes on its LAN interface [[RFC6204](#)] and sends out router advertisements (RAs) with the "M" and "O" bits set.

3.2.2. IPv6 Assignment to Homenet hosts using stateful DHCPv6

1. STB sends a DHCPv6 SOLICIT message with the OPTION_PREFIX_CLASS option set to "video" (1) within the IA_NA. The HGW checks the requested prefix class against the available prefixes it has been delegated and advertises 3001:5::1 to the STB. The STB then configures this address on its LAN interface and uses it for sourcing requests to the VOD service.
2. The PC sends a DHCPv6 SOLICIT message requesting for IA_NA with the OPTION_PREFIX_CLASS option in ORO indicating support for prefix class. The HGW checks the available prefixes it has been delegated and advertises IA_NA from P1 (3001:5:2 with property set to 0x0001) , P2 (3001:6::1) and P3 (3001:7::1) to the PC or in absence of OPTION_PREFIX_CLASS in the solicit HGW is preconfigured to assign from the "internet"(2) class as the default. The PC then configures these addresses on its LAN interface and uses it for sourcing requests to the Internet.
3. The On demand Video Application on the PC communicates with its well known Application Central using the "internet" prefix and is

directed to use "video-app" prefix if available based on agreement between service provider and on demand video application service provider. The On demand Video Application then connects using the address assigned from P3 that will offer better experience based on the SLA between the providers.

4. If the homenet hosts use SLAAC prefix delegation with the class will use the options and procedure defined in [[I-D.korhonen-6man-prefix-properties](#)]

4. Acknowledgements

The authors would like to acknowledge review and guidance received from Frank Brockners, Wojciech Dec, Richard Johnson, Erik Nordmark, Hemant Singh, Mark Townsley, Ole Troan, Bernie Volz, Maciek Konstantynowicz

5. Contributors

Authors would like to thank contributions to use cases and text for various sections received from Sindhura Bandi.

6. IANA Considerations

IANA is requested to assign an option code to OPTION_PREFIX_PROPERTY (TBD1) and OPTION_PREFIX_CLASS (TBD2) from the "DHCPv6 and DHCPv6 options" registry (<http://www.iana.org/assignments/dhcpv6-parameters/dhcpv6-parameters.xml>).

6.1. OPTION_PREFIX_PROPERTY values

IANA is requested to reserve and maintain registry of OPTION_PREFIX_PROPERTY values and manage allocation of values as per as per policy defined in [[RFC5226](#)] with IETF assigned values requiring IETF consensus, RFC Required policy, any other values other than the ones listed below are not valid.

1. 0x0001 The prefix cannot be used to reach the Internet
2. 0x0002 The prefix provides network based mobility
3. 0x0004 The prefix requires authentication
4. 0x0008 The prefix is assigned on an interface that provides security guarantees
5. 0x0010 Usage is charged

6. 0x0020 The prefix provides multi-homed redundancy
7. 0x0040 The prefix provides Internet service SLA, based on associated OPTION_PREFIX_CLASS
8. 0x0080 Unassigned
9. 0x0100 Unassigned
10. 0x0200 Unassigned
11. 0x0400 Unassigned
12. 0x0800 Unassigned
13. 0x1000 Unassigned
14. 0x2000 Unassigned
15. 0x4000 Unassigned
16. 0x8000 Unassigned

7. Security Considerations

Security issues related to DHCPv6 which are described in [section 23 of \[RFC3315\]](#) and [\[RFC3633\]](#) apply for scenarios mentioned in this draft as well.

8. Change History (to be removed prior to publication as an RFC)

Changes from -00 to -01

- a. Modified motivation section to focus on mobile networks
- b. Modified example with a mobile network and class based prefix delegation in it

Changes from -01 to -02

- a. Modified option format to be enumerated values
- b. Added IANA section to request managing of registry for the enumerated values
- c. Added initial values for the class

- d. Added section for applications to select address with a specific property

Changes from -02 to -03

- a. Added server behaviour for IA_NA and IA_PD allocation
- b. Added Class based Information-Request usage

Changes from -03 to -04

- a. Added homenet use case
- b. Split usage class into a fixed IANA maintained properties registry and a prefix class

Changes from -04 to -05

- a. Added on demand video application use case and modified the example section
- b. Added additional properties and reference for SLAAC/ND procedure

9. References

9.1. Normative References

[I-D.ietf-dhc-dhcpv4-over-ipv6]

Cui, Y., Wu, P., Wu, J., and T. Lemon, "DHCPv4 over IPv6 Transport", [draft-ietf-dhc-dhcpv4-over-ipv6-06](#) (work in progress), March 2013.

[I-D.jiang-v6ops-semantic-prefix]

Jiang, S., Sun, Q., Farrer, I., and Y. Bo, "A Framework for Semantic IPv6 Prefix", [draft-jiang-v6ops-semantic-prefix-03](#) (work in progress), May 2013.

[I-D.korhonen-6man-prefix-properties]

Korhonen, J., Patil, B., Gundavelli, S., Seite, P., and D. Liu, "IPv6 Prefix Properties", [draft-korhonen-6man-prefix-properties-02](#) (work in progress), July 2013.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.

[RFC2460] Deering, S. and R. Hinden, "Internet Protocol, Version 6 (IPv6) Specification", [RFC 2460](#), December 1998.

- [RFC2865] Rigney, C., Willens, S., Rubens, A., and W. Simpson, "Remote Authentication Dial In User Service (RADIUS)", [RFC 2865](#), June 2000.
- [RFC3315] Droms, R., Bound, J., Volz, B., Lemon, T., Perkins, C., and M. Carney, "Dynamic Host Configuration Protocol for IPv6 (DHCPv6)", [RFC 3315](#), July 2003.
- [RFC3633] Troan, O. and R. Droms, "IPv6 Prefix Options for Dynamic Host Configuration Protocol (DHCP) version 6", [RFC 3633](#), December 2003.
- [RFC3775] Johnson, D., Perkins, C., and J. Arkko, "Mobility Support in IPv6", [RFC 3775](#), June 2004.
- [RFC4862] Thomson, S., Narten, T., and T. Jinmei, "IPv6 Stateless Address Autoconfiguration", [RFC 4862](#), September 2007.
- [RFC5226] Narten, T. and H. Alvestrand, "Guidelines for Writing an IANA Considerations Section in RFCs", [BCP 26](#), [RFC 5226](#), May 2008.
- [RFC6204] Singh, H., Beebe, W., Donley, C., Stark, B., and O. Troan, "Basic Requirements for IPv6 Customer Edge Routers", [RFC 6204](#), April 2011.
- [RFC6724] Thaler, D., Draves, R., Matsumoto, A., and T. Chown, "Default Address Selection for Internet Protocol Version 6 (IPv6)", [RFC 6724](#), September 2012.

[9.2.](#) Informative References

- [RFC2629] Rose, M., "Writing I-Ds and RFCs using XML", [RFC 2629](#), June 1999.
- [RFC3552] Rescorla, E. and B. Korver, "Guidelines for Writing RFC Text on Security Considerations", [BCP 72](#), [RFC 3552](#), July 2003.

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