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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.

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       OPTION_PREFIX_PROPERTY    |        option-length(2)      |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|             Properties         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

```
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:

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     OPTION_PREFIX_CLASS      |        option-length            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|      Prefix Class           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

```
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.

```
         _----_              _----_              _----_
       _(      )_          _(      )_          _(      )_
      (Operator-1)        (Operator-2)        (Operator-3)
       (_      _)          (_      _)          (_      _)
         -+--                -+--               '-+--'
      +--------+          +--------+          +--------+
      | Mobile |          | Mobile |          | Mobile |
      |gateway |          |gateway |          |gateway |
      +--------+          +--------+          +--------+
           |                   |                   |
        +-------------.   |  .-------------+
                      |   |   |
                      |   |   |
                      |   |   |P1:"global-anchor"(1)
                      |   |   |
                  +--------+                        _----_
      +---+       |        |P2:"local-breakout"(2)_(      )_
      |AAA|. . . . . . . | Access |--------------------( Internet )
      +---+       | Aggreg |-----------+          (_      _)
                  | Gateway| P3:"guest"|              '----'
                  +--------+           |
                      |   |                    +----- Guest Access
                      |   |                              Network
                      |   +-------------+
                      |                 |
                      |              +-----+
                      |              | AR  |
                  +-----+           +-----+
                  | WLC |           *  ---------*
                  |     |           (    LAN     )
                  +-----+           *  ---------*
                  /     \               /     \
            +----+  +----+        +----+  +----+
            |WiFi|  |WiFi|        |WiFi|  |WiFi|
            | AP |  | AP |        | AP |  | AP |
            +----+  +----+        +----+  +----+
               .                     .
              / \                   / \
            MN1 MN2               MN3 MN4(guest)
```
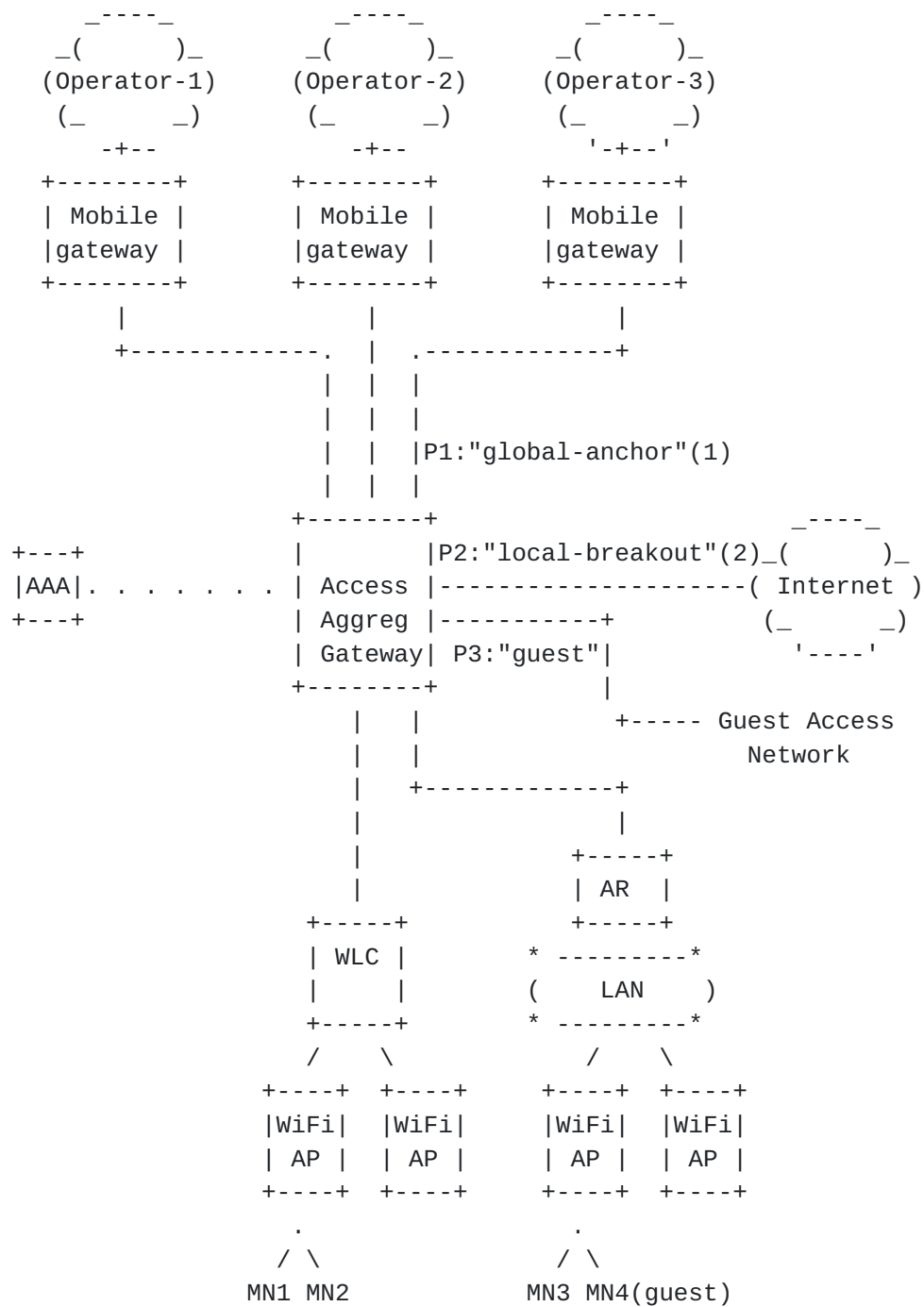
Figure 1: Example mobile network

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
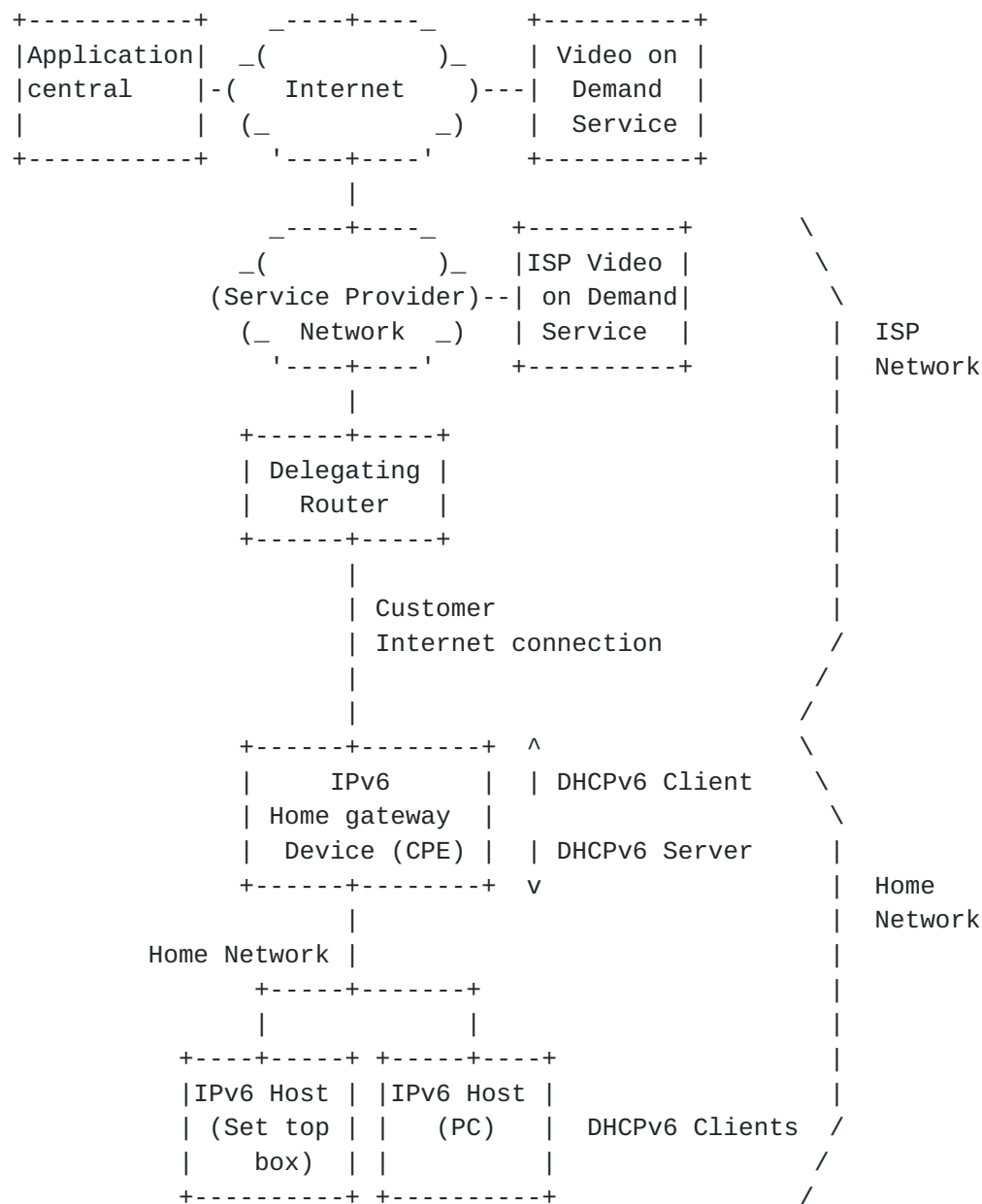requesting IA_NA from MNs through WLC and it has a preconfigured

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

```
    +-----------+    _----+----_       +----------+
    |Application|  _(           )_     | Video on |
    |central    |-(   Internet   )---|  Demand  |
    |           |  (_           _)    | Service  |
    +-----------+    '----+----'       +----------+
                         |
                    _----+----_     +----------+        \
                  _(           )_   |ISP Video |         \
                 (Service Provider)--| on Demand|          \
                  (_  Network  _)   | Service  |          |  ISP
                    '----+----'     +----------+          |  Network
                         |                                |
                 +------+-----+                           |
                 | Delegating |                           |
                 |   Router   |                           |
                 +------+-----+                           |
                        |                                 |
                        |                                 |
                        | Customer                        |
                        | Internet connection            /
                        |                               /
                        |                              /
                 +------+--------+  ^              \
                 |     IPv6      |  | DHCPv6 Client  \
                 | Home gateway  |                    \
                 |  Device (CPE) |  | DHCPv6 Server    |
                 +------+--------+  v                  |  Home
                        |                              |  Network
             Home Network |                            |
                 +-----+-------+                       |
                 |             |                       |
              +----+-----+ +-----+----+                |
              |IPv6 Host | |IPv6 Host |                |
              | (Set top | |   (PC)   |  DHCPv6 Clients  /
              |   box)   | |          |                /
              +---------+ +----------+               /
```

                 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]

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5. Contributors

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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

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