Prefix Pool Option
for DHCPv6 Relay Agent

draft-yeh-dhc-dhcpv6-prefix-pool-opt-03

IETF 80 – DHC

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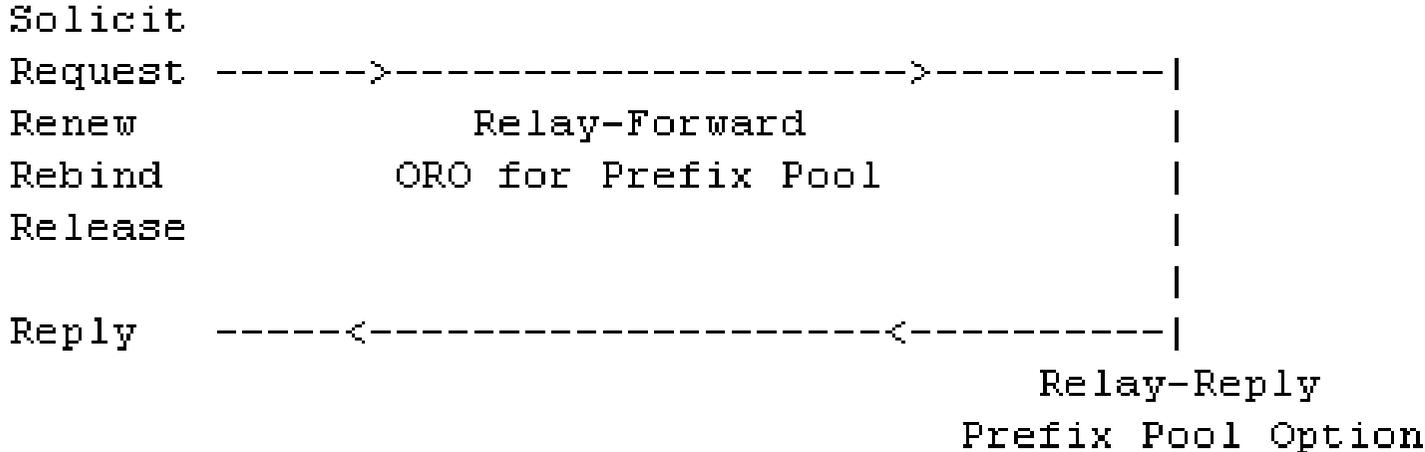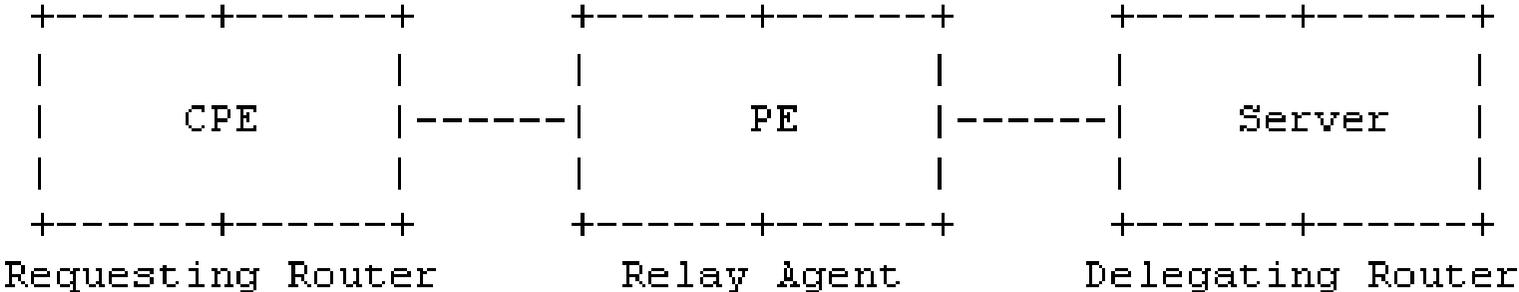Jie Hu / Qiong Sun – China Telecom

* Agreement got after IETF 79 @ Beijing

- It is necessary to aggregate the routes for PD prefixes on the PE router.
  - Reasons
    - Route per subscriber, each PD prefix for a customer network needs a route on the PE
    - IPv6 routing table at ISP core router will be unacceptable huge if each customer route be advertised
      - * draft-joshi-dhc-dhcpv6-aggr-route-opt-00 (Aggregate Route Option for Dynamic Host Control Protocol version 6 (DHCPv6) sounds also to support this statement.

- A new mechanism shall be introduced for the PE router when it acts as the DHCPv6 Relay at the same time.

* Basic Idea of this I.D.

- Transfer the information about Prefix Pool through option between Relay & Server within the scope of DHCPv6 (RFC3315) and PD (RFC3633).

- Works closely with the PD process standardized in RFC3633
  - Delegating Router Solicitation (Section 11 of RFC3633)
    – Solicit-Reply exchange
  - Requesting Router initiated PD (Section 12 of RFC3633)
    – Request-Reply exchange
    – Renew-Reply exchange
    – Release-Reply exchange
    – Rebind-Reply exchange
  - PD Reconfiguration (Section 13 of RFC3633)
    – Renew-Reply exchange

Message Exchange

```
      +------+-----+          +------+-----+          +------+-----+
      |            |          |            |          |            |
      |    CPE     |------|    PE      |------|   Server   |
      |            |          |            |          |            |
      +------+-----+          +------+-----+          +------+-----+
   Requesting Router         Relay Agent         Delegating Router

      Solicit
      Request ------>-------------------->----------|
      Renew              Relay-Forward              |
      Rebind          ORO for Prefix Pool           |
      Release                                       |
                                                    |
      Reply   -----<-------------------<----------|
                                            Relay-Reply
                                          Prefix Pool Option
```
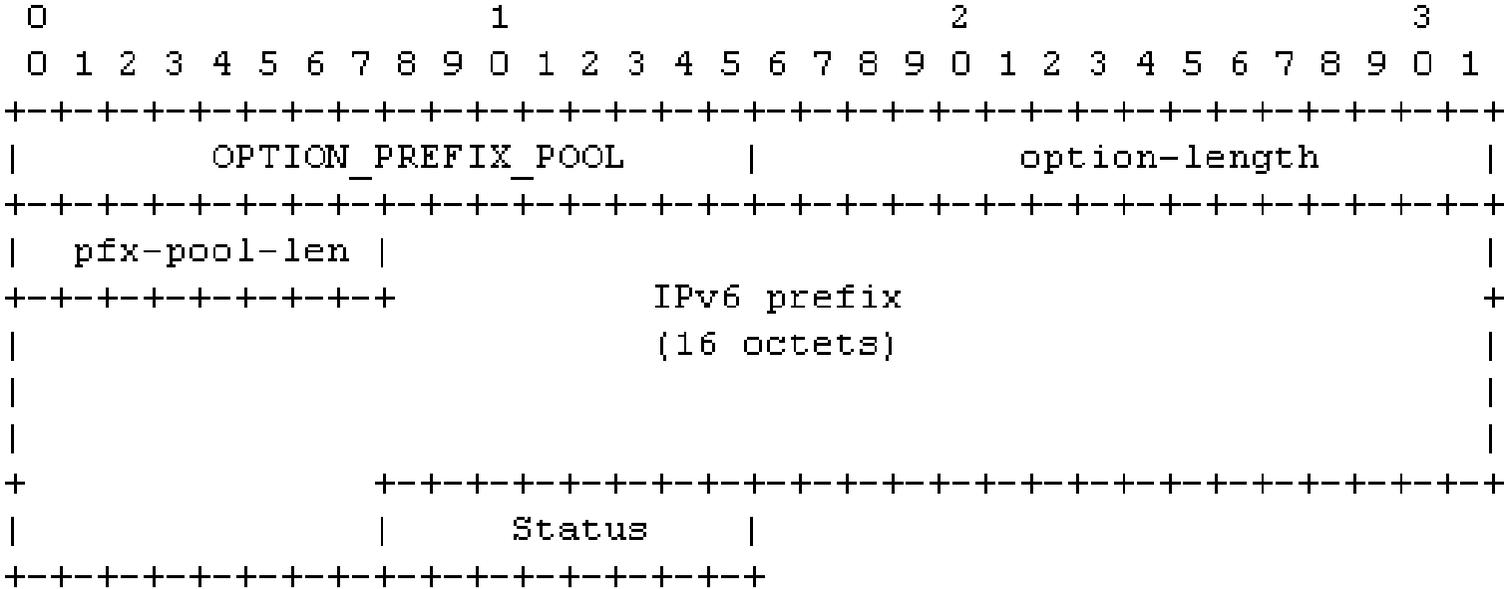
Updates from Ver.-01 to Ver.-03

- Rev. -03

  - a. Revisions on the behavior of Relay Agent about the automatic withdrawal against the aggregation route.
  - b. Corrections on the behavior of Server about the Interface ID option.

- Rev. -02

  - a. Add one more use case of ISP network architecture where CPE is directly connected to PE.
  - b. Revisions on the usage of the 'status' field in Prefix Pool option.
  - c. Extend DHCPv6 Bulk Leasequery (RFC5460) for the new usage.

Prefix Pool Option

```
 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_POOL          |         option-length         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  pfx-pool-len |                                                 |
+-+-+-+-+-+-+-+-+-+                 IPv6 prefix                   +
|                                  (16 octets)                   |
|                                                               |
|                                                               |
+                       +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       |         Status        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

```
option-code:      OPTION_PREFIX_POOL (TBD)
option-length:    18
pfx-pool-len:     Length for the prefix pool in bits
IPv6 prefix:      IPv6 prefix of the prefix pool

Status:           Status of the prefix pool
                  Name        Code
                  Valid       0
                  Released    1
```
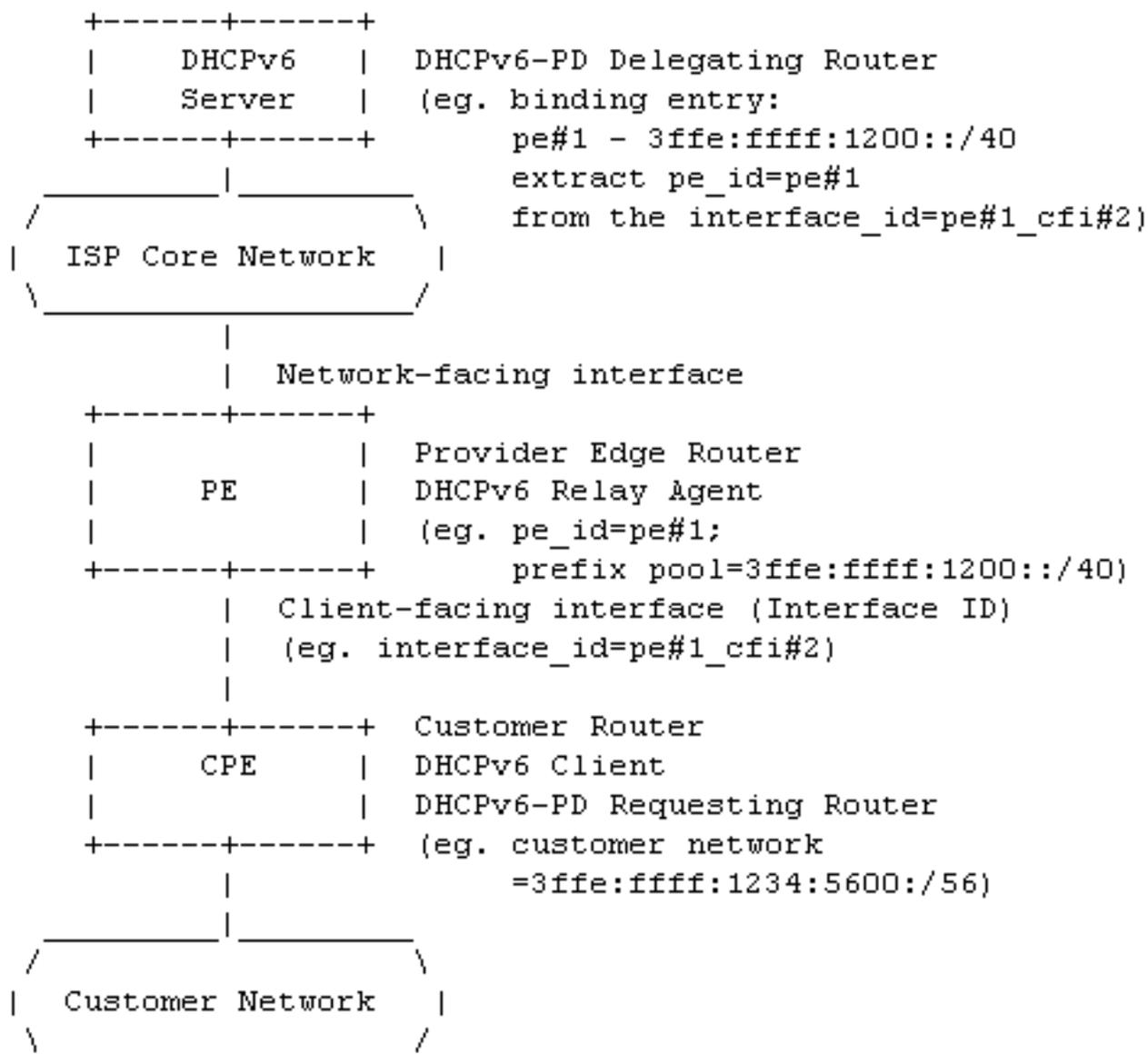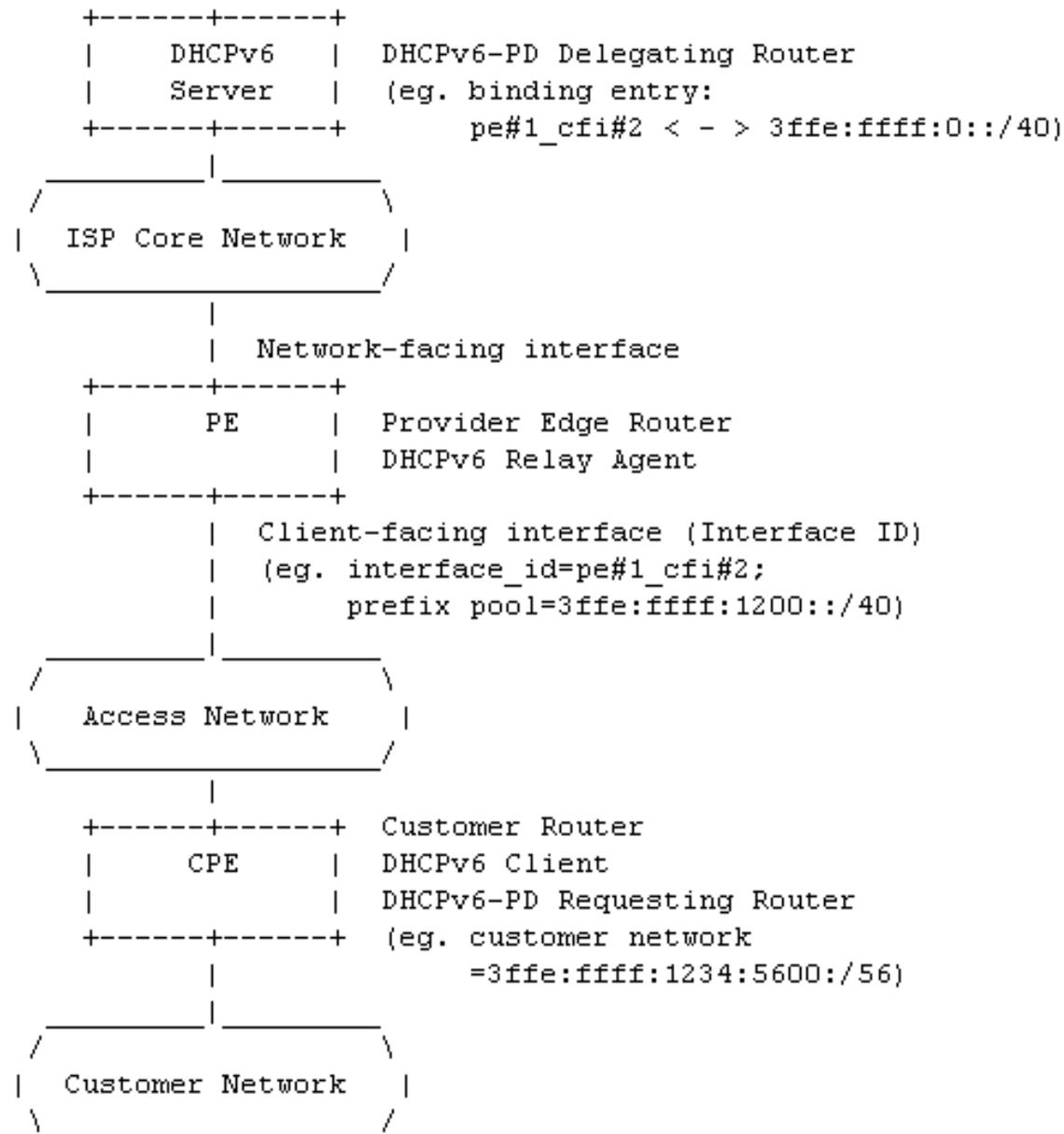
* Status of the Prefix Pool Option

- If the server supports the route aggregation on the relay,
  - the status of prefix pool automatically determined by the delegated prefixes within the associated prefix pool.
    - If there is one delegated prefix within the pool that has valid lease, the status of prefix pool will be 'Valid',
    - Otherwise, the status of prefix pool is 'Released'.

- If the server doesn't support the route aggregation on the relay,
    - the status of prefix pool will always be 'Released'.

* Use Case 1 – CPE connected to PE directly

```
+------+------+
|    DHCPv6   |    DHCPv6-PD Delegating Router
|    Server   |    (eg. binding entry:
+------+------+            pe#1 - 3ffe:ffff:1200::/40
        |                  extract pe_id=pe#1
   _____|_____             from the interface_id=pe#1_cfi#2)
  /           \
 |  ISP Core Network  |
  _____/
        |
        |    Network-facing interface
+------+------+
|             |    Provider Edge Router
|     PE      |    DHCPv6 Relay Agent
|             |    (eg. pe_id=pe#1;
+------+------+            prefix pool=3ffe:ffff:1200::/40)
        |    Client-facing interface (Interface ID)
        |    (eg. interface_id=pe#1_cfi#2)
        |
+------+------+    Customer Router
|     CPE     |    DHCPv6 Client
|             |    DHCPv6-PD Requesting Router
+------+------+    (eg. customer network
        |                  =3ffe:ffff:1234:5600:/56)
   _____|_____
  /           \
 |  Customer Network  |
  _____/
```

Use Case 2 –
CPE connected to PE through access network

```
+------+------+
|    DHCPv6   |    DHCPv6-PD Delegating Router
|    Server   |    (eg. binding entry:
+------+------+            pe#1_cfi#2 < - > 3ffe:ffff:0::/40)
        |
  _____|_____
 /             \
|  ISP Core Network  |
 _____/
        |
        |   Network-facing interface
+------+------+
|     PE      |    Provider Edge Router
|             |    DHCPv6 Relay Agent
+------+------+
        |   Client-facing interface (Interface ID)
        |   (eg. interface_id=pe#1_cfi#2;
        |        prefix pool=3ffe:ffff:1200::/40)
  _____|_____
 /             \
|  Access Network  |
 _____/
        |
+------+------+  Customer Router
|     CPE     |  DHCPv6 Client
|             |  DHCPv6-PD Requesting Router
+------+------+  (eg. customer network
        |                =3ffe:ffff:1234:5600:/56)
  _____|_____
 /             \
|  Customer Network  |
 _____/
```

* Relay Agent Behavior (Supplement-1)

- Add or remove the aggregation route entry per the status of the prefix pool.
  - If the status of the prefix pool got from the server is 'Valid', the relay agent shall add an aggregation route entry in its routing table, if the same entry has not been added in.
  - If the status of the prefix pool got from the server is 'Released', the relay agent shall withdraw the associated aggregation route entry in its routing table, if the same entry has not been removed.

- If there is no route entry directing to the customer network within the associated aggregation route, the relay agent will automatically withdraw the aggregation route.

- Use DHCPv6 Bulk Leasequery [RFC5460] to query the binding data of prefix pools in the 'Valid' status from the server.
  - The query options must include Option Request option (OPTION_ORO, 6) to request Prefix Pool option from the server.

* Server Behavior (Supplements)

- The Server decides whether to support the route aggregation on the Relay or not.

    - If the server is set to support, the status of the prefix pool can be determined by the delegated prefixes within the associated prefix pool.

        - If at least one of delegated prefix in the associated prefix pool has valid lease, the server shall set the status of the prefix pool to be 'Valid'.
        - If the lease of each delegated prefix within the associated prefix pool got expired, or if the delegated prefix in the relay-forward message of RELEASE is the last prefix releasing in the associated prefix pool, the server shall set the status of the associated prefix pool to be 'Released'.

    - If the server is set to not support, the status of the prefix pool will always be 'Released'.

- When the Server changes the setting to support the route aggregation on the Relay for the particular prefix pool, the server may initiates the relay-reply message of RECONFIGURE (10) including Prefix Pool option to add or withdraw the prefix pool and the associated aggregation route on the Relay if at least one delegated prefix within the prefix pool still has the valid lease.

* Server Behavior (Supplements-2)

- After received the LEASEQUERY (14) message from the relay with (OPTION_LQ_QUERY, 44) including (OPTION_ORO, 6) to request Prefix Pool option, the Server must include the (OPTION_CLIENT_DATA, 45) in the LEASEQUERY-REPLY (15) and LEASEQUERY-DATA (16) message to convey the binding data of the associated prefix pools with the 'Valid' status through the established TCP connection per RFC5460.

- Each Client Data option shall contain one Prefix Pool option, and might contain one Interface ID option.

- In order to be able to give the meaningful replies to different type of query, the server has to be able to maintain the relevant association of prefix pools with the RELAY_ID, link addresses or Remote_ID of the relay agent in its binding database.

Proposal

- Call for adoption as WG item again?
    - Ted did it in the mailing list at Nov. 18th, 2010, for the 1st time.

Acknowledgement

- Thanks for the off-line discussion from ver.-01 to ver.-03 with:
    - Christian Jacquenet
    - Sven Ooghe