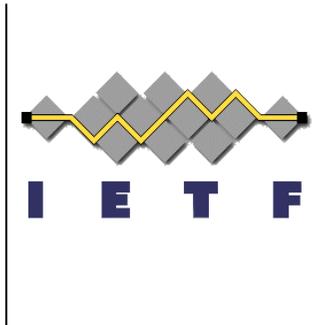# DHC WG
IETF 79

Prefix Exclude Option for DHCPv6-based Prefix Delegation

`draft-ietf-dhc-pd-exclude-00`

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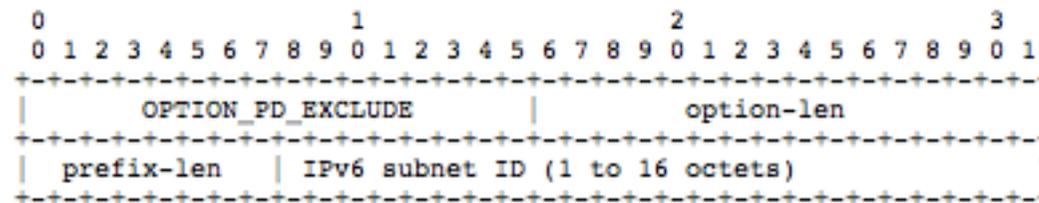
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Background

- DHCPv6-PD RFC3633 has an explicit limitation described in Section 12.1 that a prefix delegated to a requesting router cannot be used by the delegating router.

- This is an issue for deployments where:
  - Unnumbered model is not used
  - Delegated prefixes must be aggregatable with the prefix used in requesting router's upstream interface:
    - Routing efficiency
    - Policy control easier if single prefix / client
  - "Wasting" prefixes is a concern

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Solution – Exclude a specific prefix

- New IAprefix option for OPTION_IAPREFIX (RFC3633):
  - OPTION_PD_EXCLUDE.
  - Defines a hole in the delegated prefix.
- Modified RR indicates support in OPTION_ORO
  - Backward compatible.
- Modified DR uses optimization when possible.
- Excluded prefixes are encoded efficiently as "subnet IDs" of the actual delegated prefix.

```
 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_PD_EXCLUDE       |          option-len           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   prefix-len  |  IPv6 subnet ID (1 to 16 octets)              ~
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

                    Prefix Exclude Option
```
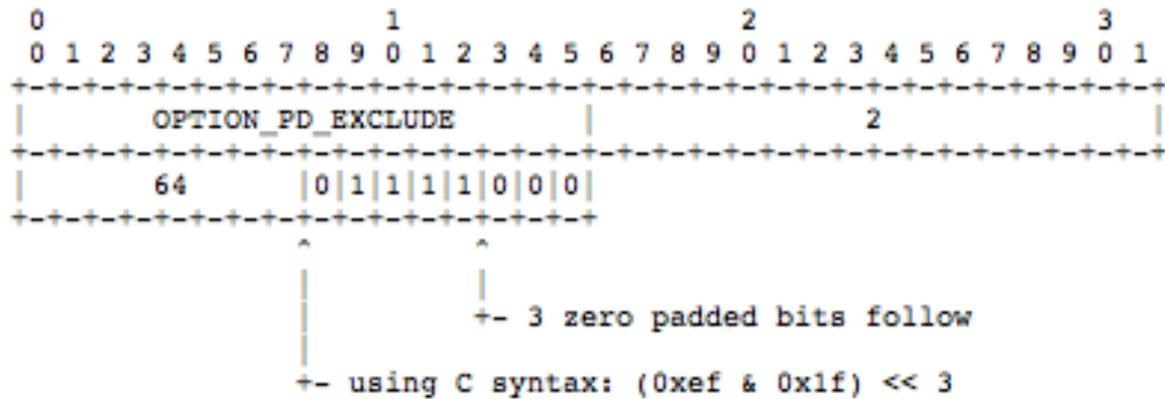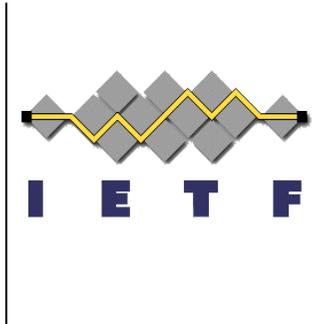
Option details.. and an example
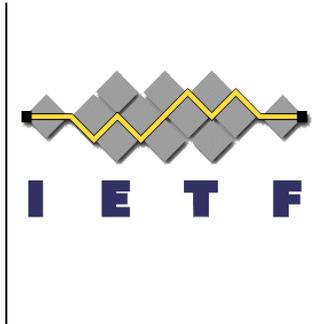
- The prefix in the OPTION_PD_EXCLUDE option MUST be part of the   delegated prefix in the OPTION_IAPREFIX.
- Example:
  - the RR has earlier been assigned a 2001:db8:dead:beef::/64 prefix by the DR, and the delegated prefix in the OPTION_IAPREFIX is 2001:db8:dead:bee0::/59.
  - In this case, 2001:db8:dead:beef::/64 is a valid prefix to be used in the OPTION_PD_EXCLUDE   option.
- The OPTION_PD_EXCLUDE option would be encoded as follows:

```
 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_PD_EXCLUDE         |               2           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|        64       |0|1|1|1|1|0|0|0|
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
                   ^               ^
                   |               |
                   |               +- 3 zero padded bits follow
                   |
                   +- using C syntax: (0xef & 0x1f) << 3
```

Example (3GPP minded)

- Requesting Router (e.g. a mobile device) is first assigned /64 for its uplink interface with SLAAC.

- Requesting Router informs Delegating Router about support for OPTION_PD_EXCLUDE in OPTION_ORO.

- DR knows which prefix to exclude (possibly with the help of IA_PD or by other session information).

- DR replies with delegated prefix and OPTION_IAPREFIX IAprefix-option contains the excluded prefix encapsulated in OPTION_PD_EXCLUDE.
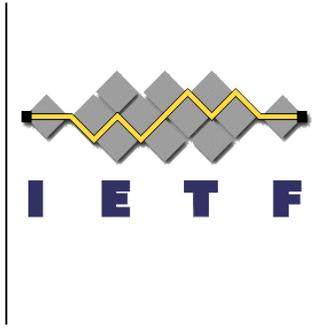
Summary

- Optional optimization for prefix delegation for certain network architectures.

- Feature introduced as an option for OPTION_IAPREFIX.

- Backwards compatible with RFC3633 RR and DR.