IPv6 multicast address assignment with DHCPv6

draft-jdurand-assign-addr-ipv6-multicast-dhcpv6-00

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The M6Bone network
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The problem

• Raised in 6NET (www.6net.org)
• How end-users choose an IPv6 multicast address?
  – ASM problem – Needed for a session
  – Session announcement not considered
  – Should work for all types of multicast addresses (RFC 3306, Embedded-RP... ) and all scopes (global, site...)

• Mechanism must be
  – Easy to use
  – Scalable
  – Available (implementations)
Existing mechanisms

- MADCAP (RFC 2970)
- SAP (RFC 2974)
- Random choice of the address
- GLOP (RFC 3180)
- ZMAAP – Zeroconf Multicast Address Allocation Protocol
Why considering DHCPv6?

- DHCPv6 (RFC 3315)
  - Will be widely deployed (maybe as DHCP is for IPv4)
  - Flexible (use options)
- DHCPv6 makes it possible to assign several addresses to a host
- Was not possible with DHCP
- Let’s use this feature for multicast
DHCPv6 – New options

- No changes to the DHCPv6 protocol!
- We propose 2 new options:
  - IA_MA option
    IA_MA: Identity Association for IPv6 Multicast Addresses
    IA_TA and IA_NA defined today for unicast addresses
    Embeds requests for IPv6 multicast addresses
  - Scope option
    Makes it possible to request addresses within a specific scope (site-local, global...)
Messages overview
IA_MA 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 number  (to be defined) | option length |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| IAID (Identity Association IDentifier) |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| options  (IPv6 multicast addresses, ...) |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
Scope option

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<th>0</th>
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Address timers

• Use the DHCPv6 IA address option fields:
  – Preferred lifetime
  – Valid lifetime
• Address is assigned as soon as the request is accepted (minDesiredStartTime and MaxDesiredStartTime not used)
• Simplifies the assignment
Group-ID for addresses assigned with DHCPv6

- RFC 3307 defines guidelines and group-ID ranges for IPv6 multicast addresses allocations
  - 0x80000000 – 0xFFFFFFFF for dynamic assignments
- We propose to reserve a specific group-ID range for addresses assigned with DHCPv6
  - 0x90000000 – 0x9FFFFFFF
- No overlap with other assignment protocols (MADCAP for instance)
Scenario 1

2001:660:3001::/48

Configured to assign IPv6 multicast addresses in:
FF7E:140:2001:660:3001:12::/96
Scenario 1

DHCPv6 server

Scope = global (E)

Wants to start a global multicast session – needs an address
Scenario 1

Can start transmitting on given address and announce it to other participants.

Site

DHCPv6 server

FF7E:140:2001:660:3001:12::/96

Scenario 1.2

2001:660:3001::/48

Configured to assign IPv6 multicast addresses in:
FF7E:140:2001:660:3001:12::/96
FF15::/16

BSR in the site
Site
Scenario 1.2

DHCPv6 server

Scope = local (5)

Wants to start a multicast session in the site — needs an address

Site

RP
Scenario 1.2

Can start transmitting on given address and announce it to other participants.
Scenario 2

 ISP

 small site

RP
Scenario 2

ISP allocates multicast prefixes to its customers.

The site can also deploy its own RP in this scenario. Use of resources depends then from the choice of the address.
Scenario 2.2
Scenario 2.2

Campus allocates multicast prefixes to labs. The site can also deploy its own RP in this scenario. Use of resources depends then from the choice of the address.
Scenario 3

Configured to assign IPv6 multicast addresses in:

Lab 1 wants to start a global multicast session – needs an address.

- 2001:660:3001:12A1::1
- 2001:660:3001:12B8::1
Scenario 3
Scenario 3

Retrieve client’s location (lab) using its address, client’s DUID, User class option....

Campus

DHCPv6 server

Lab 1

Lab 2
Scenario 3

The organization can also deploy its own RP in this scenario. Use of resources depends then from the choice of the address.
Scenario 3.2

Configured to assign IPv6 multicast addresses in:
FF15::/16 for every lab

Lab 1

Lab 2

Wants to start a site-local multicast session – needs an address

Lab 1

Lab 2

Campus

DHCPv6 server

FF15::/16

RP

FF15::/16

RP
Scenario 3.2

- RP
- Campus
- DHCPv6 server
- Lab 1
  - FF15::/16
  - scope = 5
- Lab 2
  - FF15::/16
  - RP
Scenario 3.2

Retrieve client’s location (lab) using its address, client’s DUID, User class option....

Campus

DHCPv6 server

Lab 1

FF15::/16

Lab 2

FF15::/16
Scenario 3.2

Campus

Lab 1
FF15::/16

RP

Lab 2
FF15::/16

FF15::/16

RP

ABC:1234

DHCPv6 server
Scenario 3.2

The organization can also deploy its own RP in this scenario. Use of resources depends then from the choice of the address.
Thanks!

• Ralph Droms
• David Meyer
• Pekka Savola
• Christian Strauf
• Bernard Tuy
• Stig Venås
• All 6NET partners having worked on D3.4.3
Open discussions

• Split in 2 drafts:
  – Assignment model to be discussed in MBoneD
  – New DHCPv6 options to be discussed in DHC

• Range for group ID – usefulness?

• Timers specified with a new DHCPv6 option?

• Scope option mandatory?

• DHCPv6 in userspace – not in kernel
  – Potential problems?

• IPv4 multicast address assignment?

• Prefix delegation for IPv6 multicast addresses?
Next step: WG I-D?