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Things To Be Considered for RFC 3484 Revision
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Abstract

RFC 3484 has several known descriptions to be modified mainly because of the deprecation of IPv6 site-local unicast address and the coming of ULA. This document covers these essential points to be modified and also possible useful changes to be included in the revision of RFC 3484.

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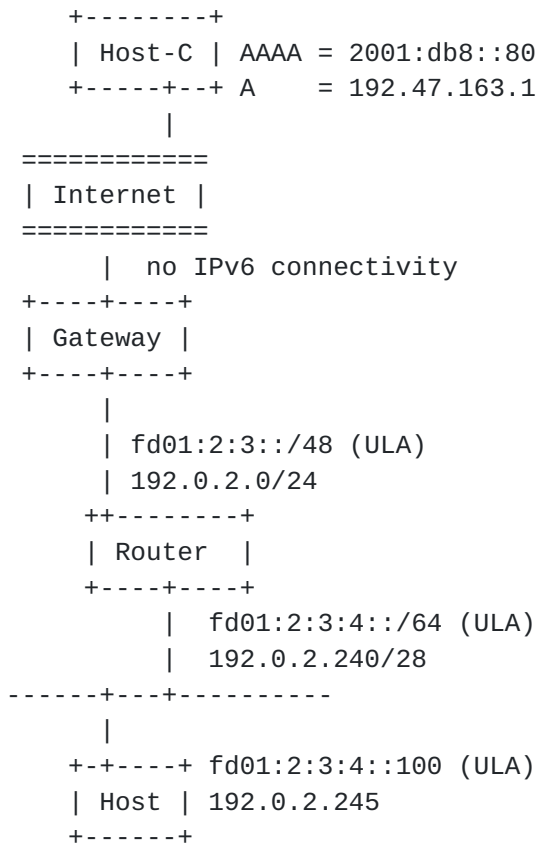
1. Introduction

RFC 3484 [RFC3484] defines default address selection rules for IPv6 and partly for IPv4. Because of the deprecation of IPv6 site-local unicast address and the coming of ULA, [RFC4193] these rules in RFC 3484 are known to cause serious communication failure problems.

1.1. Problem Example

When an enterprise has IPv4 Internet connectivity but does not yet have IPv6 Internet connectivity, and the enterprise wants to provide site-local IPv6 connectivity, ULA is the best choice for site-local IPv6 connectivity. Each employee host will have both an IPv4 global or private address and a ULA. Here, when this host tries to connect to Host-C that has registered both A and AAAA records in the DNS, the host will choose AAAA as the destination address and ULA for the source address. This will clearly result in a connection failure.



[Fig. 1]

This problem can be solved by adding one entry to the default policy table. The changed table looks like this.

Prefix	Pref	Label	
::1/128	50	0	
::/0	40	1	
2002::/16	30	2	
fc00::/7	35	5	(added for ULA)
::/96	20	3	
::ffff:0:0/96	10	4	

This problem was mentioned at ipv6 mailing lists by Pekka Savola.

2. Proposed Changes to RFC 3484

2.1. To remove site-local unicast address

RFC3484 contains a few "site-local unicast" and "fec::" description. It's better to remove examples related to site-local unicast address, or change examples to use ULA. Possible points to be re-written are below.

- 2nd paragraph in Section 3.1 describes scope comparison mechanism.
- Section 10 contains examples for site-local address.

2.2. To change default policy table

The default rule today is:

Prefix	Precedence	Label
::1/128	50	0
::/0	40	1
2002::/16	30	2
::/96	20	3
::ffff:0:0/96	10	4

The changes we should consider for the default policy table are,

- IPv4-compatible IPv6 address is deprecated. [RFC4291] (However, should we keep this entry for the sake of backward compatibility ?)
- Teredo [RFC4380] is defined and has 2001::/32. Teredo's priority should be less or equal to 6to4, considering its characteristic of tunnel mechanism. About Windows, this point is already in the implementation.
- ULA should have less precedence than Global IPv6 unicast address. As described in Section 1.1, ULA is a possible cause of connection failure. Things will worsen as IPv6 deployment proceeds and more FQDNs have both A and AAAA records.

When we apply these changes, the default policy table looks like

this.

Prefix	Precedence	Label	
::1/128	50	0	
::/0	40	1	
2002::/16	30	2	
fc00::/7	20	3	(For ULA)
::ffff:0:0/96	10	4	
2001::/32	5	5	(For Teredo)

Teredo has the worst precedence. This means that, for IPv4-IPv6 dual-stack host, Teredo address will be used only when the destination host has an IPv6 address only.

ULA has its own label and higher precedence than IPv4 address. This means ULA will be used when the destination host also uses ULA. If a host has a ULA and a IPv4 address, the host will not use ULA when connecting to a dual-stack host in the Internet.

2.3. To add ULA related considerations

For example, we have to pay attention to source address selection for a multicast packet. By default, ULA will be chosen for a multicast packet of any scope.

This issue cannot be solved by changing a RFC 3484 rule. THis is because, multicast and unicast have different sets of scope and it is site-dependent which unicast address scope is appropriate for the site's multicast scope.

2.4. To make address type dependent control possible

It is hard to define default preferences for these address types, RA-based, DHCP-based, manual-based, and privacy extention address, because the appropriate preference value depends on the usage of these addresses, but not on address types themselves. It is the policy table where you can control host's address selection behavior.

For example, You can set priority on RFC 3041 [RFC3041] address by putting a line in policy table specifying RFC 3041 address by 128-bit prefixlen and continuing to update policy table according to RFC 3041 address re-generation. But, this is surely troublesome for users and implementers.

One idea is to update RFC 3484 policy table definition so that it can handle meta addresses like privacy, DHCPv6 generated, RA generated, manually generated (and even Home Address ?)

To prefer privacy address by default, and to prefer RA-generated address for site internal, the policy table will look like this.

Prefix	Pref	Label
2001:db8:1234::(PRIVACY)/128	30	2
::/0	10	2
2001:db8:1234::(RA):/128	30	1
2001:db8::/48	20	1

3. Security Considerations

No security risk is found that degrades RFC 3484.

4. IANA Considerations

Address type number for the policy table may have to be assigned by IANA.

5. References

5.1. Normative References

[RFC3484] Draves, R., "Default Address Selection for Internet Protocol version 6 (IPv6)", RFC 3484, February 2003.

[RFC4193] Hinden, R. and B. Haberman, "Unique Local IPv6 Unicast Addresses", RFC 4193, October 2005.

5.2. Informative References

[RFC3041] Narten, T. and R. Draves, "Privacy Extensions for Stateless Address Autoconfiguration in IPv6", RFC 3041, January 2001.

[RFC4291] Hinden, R. and S. Deering, "IP Version 6 Addressing Architecture", RFC 4291, February 2006.

[RFC4380] Huitema, C., "Teredo: Tunneling IPv6 over UDP through Network Address Translations (NATs)", RFC 4380, February 2006.

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