Behave Working Group
Internet-Draft
Intended status: Standards Track
Expires: September 6, 2010

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March 5, 2010

Checksum-Neutral Prefix NAT for IPv6
draft-kato-behave-prefix-nat-01.txt

Abstract

This document describes a use-case of IPv6-to-IPv6 network address translation, and a translation mechanism for smaller network. To be used typically in a network where IPv6 /64 prefix is advertiesed, a network address translation mechanism is proposed that is based on Interface Identifier rewriting to be checksum neutral.

Status of this Memo

This Internet-Draft is submitted to IETF in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on September 6, 2010.

Table of Contents

1. Introduction

The IPv6-to-IPv6 translation mechanism proposed in NAT66 document. NAT66 document [I-D.mrw-behave-nat66]. This assumes that a network is assigned /48 or larger address block. This is because the mechanism uses 16 bits of IPv6 address for subnetting to make the translation neutral to address translation.

However, in some environment, a network cannot get such a large address space. Then, we propose another IPv6-to-IPv6 translation mechanism that can be used in a network with /48 or smaller address block and that is neutral to transport layer checksum. This mechanism also has a characteristics of one-to-one mapping, to keep the end-to-end transparency as much as possible.

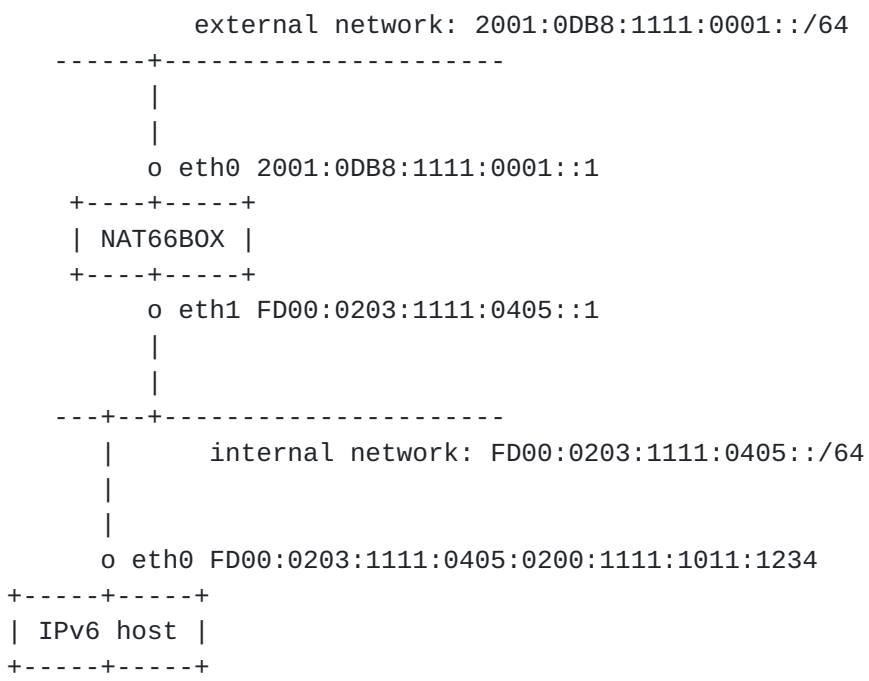
2. Proposal of Address Translation using Interface Identifier

A IPv6 address translation mechanism for smaller network is proposed in this section. This translation mechiansm is one-to-one mapping based, and is Interface Identifier rewriting based, to make it checksum neutral.

Regarding the prefix part of an IPv6 address, it is simply replaced with the predefined external/internal prefix value. Regarding the Interface Identifier part, the modified value is chosen so that the address translation does not have an impact on transport layer checksum, which is almost the same technique adopted in NAT66 [I-D.mrw-behave-nat66].

2.1. Address Translation Example

Example network structure is described below.



example network

When IPv6 host sends a packet destined to external network, NAT66BOX receives the following IPv6 packet.

dst IPv6 address: (somewhere in external network)
src IPv6 address: fd00:0203:1111:0405:0200:1111:1011:1234

NAT66BOX performs the following address translation to the source address of the IPv6 packet, and forward the packet to the upstream. Here, it is assumed that the function cksum(x) calculates the 16-bit one's complement sum as defined in RFC1071 [RFC1071].

1. Calculates the difference between to-be-translated prefix checksum and translated prefix checksum.

   cksum(FD01:0203:1111:0405) => 0x141B
   cksum(2001:0DB8:1111:0001) => 0x3ECB

2. Gets the difference of the two prefixes based on one's complement sum.

   0x3ECB - 0x141B = 0x2AB0

3. Gets the difference of the least significant 16 bits of the to-be-translated IPv6 address and the difference of the prefixes' checksums calculated at 2.

0x1234 - 0x2AB0 = 0xE783

4. Puts the value of 3 to the least significant 16 bits of the translated address Interface Identifier, and gets the translated address.

2001:0DB8:1111:0001:0200:1111:1011:E783

In the same way, translation of incoming packet from external network can be processed.

3. Discussion

The mechanism describes here ignores the meaning U/L bit described in [RFC4291]. As the Interface Identifier part of the translated address is not assured of uniqueness, the U/L bit should not be set to 1.

The workarounds for this issue are to have per-session translation table, to administrate the addresses of hosts in local network and make all of them use addresses with U/L bit 0.

4. IANA Considerations

This document has no actions for IANA.

5. Security Considerations

TBD

6. References

6.1. Normative References

[I-D.mrw-behave-nat66]
Wasserman, M. and F. Baker, "IPv6-to-IPv6 Network Address Translation (NAT66)", draft-mrw-behave-nat66-02 (work in progress), March 2009.

[RFC1071] Braden, R., Borman, D., Partridge, C., and W. Plummer, "Computing the Internet checksum", RFC 1071, September 1988.

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

6.2. Informative References

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