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NAT444 addressing models
draft-shirasaki-nat444-isp-shared-addr-08

Abstract

This document describes addressing models of NAT444. There are some addressing models of NAT444. The addressing models have some issues of network behaviors, operations, and addressing. This document helps network architects to use NAT444 after IPv4 address exhaustion.

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1. Introduction

NAT444 [I-D.shirasaki-nat444] is one of solutions after IPv4 address exhaustion. ISP can select some addressing models of NAT444. The addressing models have some issues of network behaviors, operations, and addressing. This document describes these issues and solutions. It boosts up to deploy the IPv6 Internet.

2. Addressing Models

The key of addressing model is the address block between Customer Premises Equipment (CPE) and Carrier Grade NAT (CGN) [I-D.ietf-behave-lsn-requirements]. It's mentioned in this section. The best addressing model is "ISP Shared Address" which is defined in [I-D.shirasaki-isp-shared-addr] and briefly described in this section.

2.1. Global Address

ISP cannot assign IPv4 Global Address any more after the exhaustion.

2.2. Private Address

It has two major problems.

2.2.1. Policy Based Routing Issue

If both source and destination address of the packet are inside CGN, it has to go through CGN. The reason is that some servers reject receiving packets when the source address of receiving packet is Private Address. Therefore packets have to go through the CGN for rewriting the source address from Private Address to Global Address. Additionally, if Private Address and Global Address co-exist inside CGN, the ISP has to use Policy Based Routing (PBR).

2.2.2. Address Block Duplication Issue

The Private Address in ISP's network could conflict with its customer's network address. Many CPEs between customer's network and ISP's network cannot route the packet under this situation. To avoid this, ISP has to negotiate with its all customers not to use the reserved Private Address block.

2.2.3. Class-E Address (240/4)

It is known that some equipment such as routers and servers reject packets from or to this address block. So, to use this address block

in ISP's network, ISP has to request its customers to replace their equipment. In addition to that, ISP might have to replace their equipment when it doesn't handle Class-E address packets properly.

2.2.4. ISP Shared Address

ISP Shared Address is the newly defined IPv4 address block that is to be allocated from IANA free pool. It doesn't have any problem. Spending some blocks from the exhausting IANA free pool could be regarded as a problem, but from long view, this problem is much smaller than its great merit. ISP Shared Address is defined in [I-D.shirasaki-isp-shared-addr].

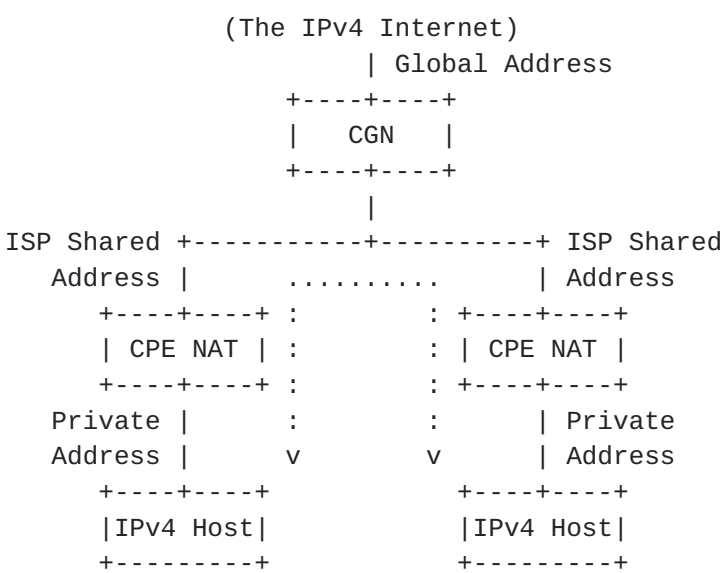
3. Example Architectures

This section explains example architectures how to design NAT444 with ISP Shared Address.

3.1. Direct Routing inside CGN

This architecture enables direct communication between customers inside same CGN. It has the following advantages.

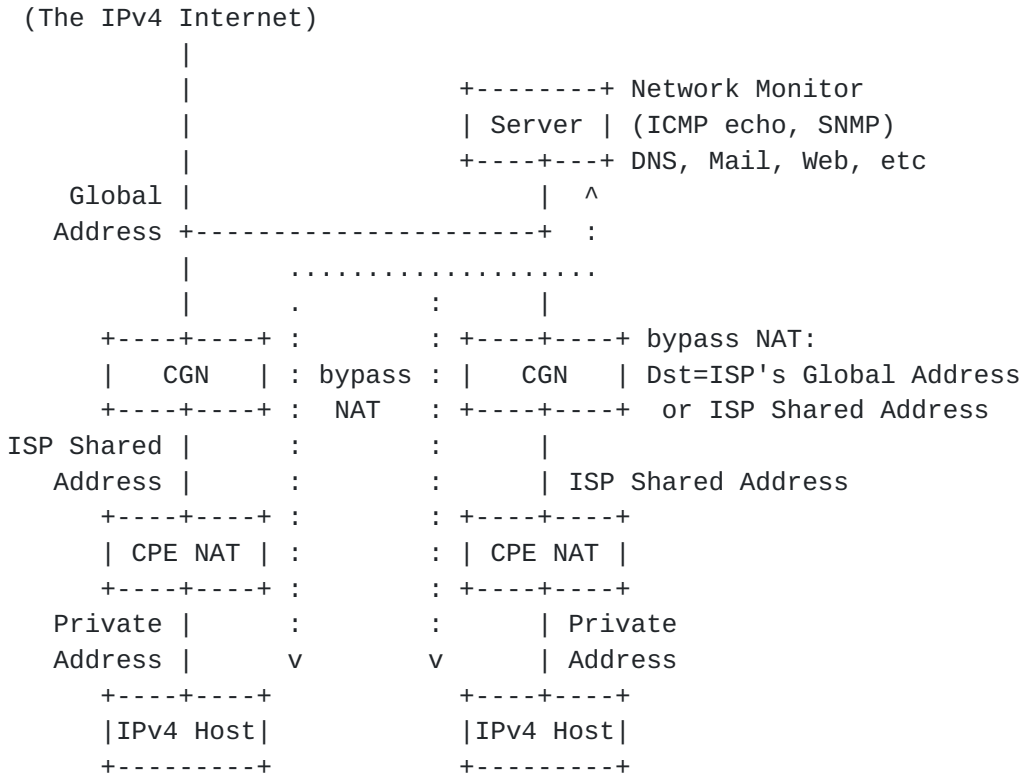
- The packets don't go through CGN. (No hairpining)
- The customers inside CGN can use bidirectional applications (e.g. TV Conference, VPN).
- No need to use Policy Based Routing.



3.2. CGN Bypassing

This architecture is bypassing the NAT function of CGN. It has the following advantage.

- The customers inside an ISP can use bidirectional applications (e.g. TV Conference, VPN).
- Any communication in single ISP doesn't consume CGN external port.
- ISP's servers outside CGN can access CPE. (e.g. ICMP echo, SNMP, remote access)
- ISP's servers outside CGN can distinguish which customer's connection it receives. (e.g. DNS, Mail)

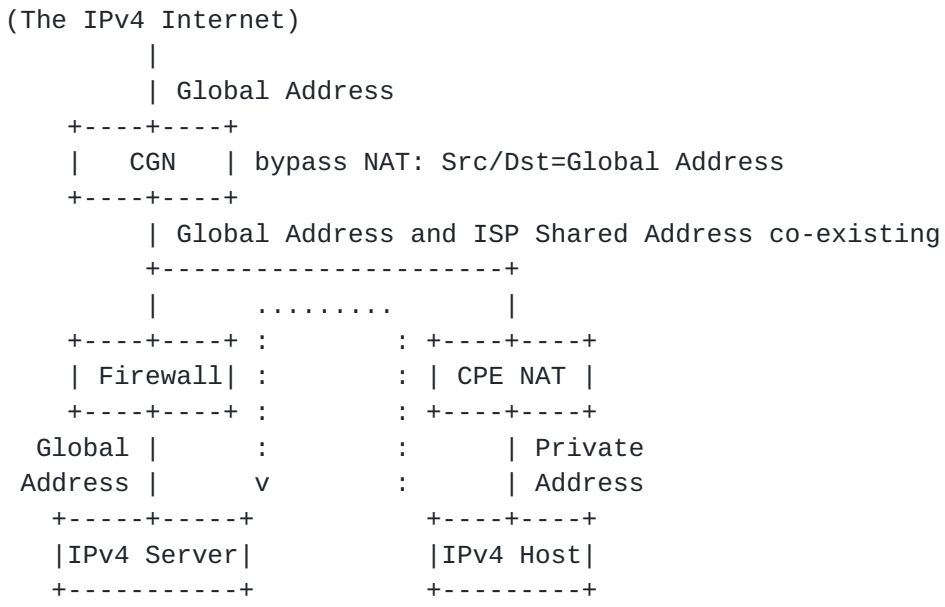


3.3. Global Address Customers inside CGN

This architecture enables co-existing Global Address and ISP Shared Address inside CGN.

It enables direct communications from ISP Shared Address customer to Global Address customer inside same CGN. It has the following advantage.

- The ISP can put ISP Shared Address customer and Global Address customer in the same concentrator.
- The customers inside CGN can use bidirectional applications (e.g. TV Conference, VPN).
- No need to use Policy Based Routing.



4. Acknowledgements

Thanks for the input and review by Shirou Niinobe, Takeshi Tomochika, Tomohiro Fujisaki, Dai Nishino, JP address community members, AP address community members and JPNIC members.

5. IANA Considerations

IANA is to allocate a certain size of address block from IANA free pool. The size of it is described in [I-D.shirasaki-isp-shared-addr]

6. Security Considerations

There are no security considerations.

7. Normative References

[I-D.shirasaki-isp-shared-addr]
Yamagata, I., Miyakawa, S., Nakagawa, A., Yamaguchi, J., and H. Ashida, "ISP Shared Address", draft-shirasaki-isp-shared-addr-07 (work in progress), January 2012.

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Perreault, S., Yamagata, I., Miyakawa, S., Nakagawa, A., and H. Ashida, "Common requirements for Carrier Grade NATs (CGNs)", draft-ietf-behave-lsn-requirements-07 (work in progress), June 2012.

[I-D.shirasaki-nat444]
Yamagata, I., Shirasaki, Y., Nakagawa, A., Yamaguchi, J., and H. Ashida, "NAT444", draft-shirasaki-nat444-05 (work in progress), January 2012.

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