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464XLAT: Combination of Stateful and Stateless Translation
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Abstract

This document describes a method (464XLAT) for IPv4 connectivity across IPv6 network by combination of stateful translation and stateless translation. 464XLAT is a simple technique to provide IPv4 access service while avoiding encapsulation just by using twice IPv4/IPv6 translation standardized in [RFC6145] and [RFC6146].

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1. Introduction

The IANA unallocated IPv4 address pool was exhasuted on February 3, 2011. It is likely that each RIR's unallocated IPv4 addres pool will exhaust in the near future. In this situation, it will be difficult for most ISPs to assign global IPv4 address to end users.

This document describes an IPv4 over IPv6 solution as one of the measures of IPv4 address exhaustion and encouragement of IPv6 deployment.

This method (464XLAT) in this document is using twice IPv4/IPv6 translation standardized in [\[RFC6145\]](#) and [\[RFC6146\]](#). It does not need DNS64 [\[RFC6147\]](#) technology for the purpose of providing IPv4 over IPv6 service by this method. It is also possible to provide single IPv4/IPv6 translation service, which will be needed in the near future. This feature is one of the advantages, because it can be an encouragement to gradually transition to IPv6.

This method is a combination of existing technologies and provides a simple way of providing connectivity to the IPv4 Internet without the use of a CGN nor a port mapping algorithm.

2. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [\[RFC2119\]](#).

3. Terminology

PLAT: PLAT is Provider side translator(XLAT). A stateful translator complies with [\[RFC6146\]](#) that performs 1:N translation. It translates global IPv6 address to global IPv4 address, and vice versa.

CLAT: CLAT is Customer side translator(XLAT). A stateless translator complies with [\[RFC6145\]](#) that performs 1:1 translation. It algorithmically translates private IPv4 address to global IPv6 address, and vice versa. It has also IPv6 router function that can forward IPv6 packet for IPv6 hosts in end-user network. Furthermore, it has DNS Proxy function with IPv6 transport that provides name resolution for IPv4 hosts and IPv6 hosts in end-user network. The presence of DNS64 [\[RFC6147\]](#) and any port mapping algorithm are not required.

4. Network Architecture

464XLAT method is shown in the following figure.

6.2. DNS Proxy Implementation

CLAT perform DNS Proxy for IPv4 hosts and IPv6 hosts in end-user network. It MUST provide name resolution with IPv6 transport. It does not need DNS64 [\[RFC6147\]](#) function.

6.3. IPv6 Fragment Header Consideration

In the 464XLAT environment, the PLAT and CLAT SHOULD include an IPv6 Fragment Header, since IPv4 host does not set the DF bit. However, the IPv6 Fragment Header has been shown to cause operational difficulties in practice due to limited firewall fragmentation support, etc. Therefore, the PLAT and CLAT may provide a configuration function that allows the PLAT and CLAT not to include the Fragment Header for the non-fragmented IPv6 packets. At any rate, both behaviors SHOULD match.

6.4. Auto Prefix Assignment

Source IPv6 prefix assignment in CLAT is via DHCPv6 prefix delegation or another method. Destination IPv6 prefix assignment in CLAT is via some method. (e.g., DHCPv6 option, TR-069, DNS, HTTP, etc.)

7. Deployment Considerations

Even if the Internet access provider for consumers is different from the PLAT provider (another Internet access provider or Internet exchange provider, etc.), it can implement traffic engineering independently from the PLAT provider. Detailed reasons are below.

1. The Internet access provider for consumers can figure out IPv4 source address and IPv4 destination address from translated IPv6 packet header, so it can implement traffic engineering based on IPv4 source address and IPv4 destination address (e.g. traffic monitoring for each IPv4 destination address, packet filtering for each IPv4 destination address, etc.). The Tunneling methods do not have such a advantage, without any deep packet inspection for visualizing the inner IPv4 packet of the tunnel packet.
2. If the Internet access provider for consumers can assign IPv6 prefix greater than /64 for each subscriber, this 464XLAT method can separate IPv6 prefix for native IPv6 packets and XLAT prefix for IPv4/IPv6 translation packets. Accordingly, it can identify the type of packets ("native IPv6 packets" and "IPv4/IPv6 translation packets"), and implement traffic engineering based on IPv6 prefix.

And this 464XLAT method have two capabilities. One is a IPv6 -> IPv4 -> IPv6 translation for sharing global IPv4 addresses, another is a IPv4 -> IPv6 translation for reaching IPv6 only servers from IPv4 only clients that can not support IPv6. IPv4 only clients will remain for a while.

8. Security Considerations

To implement a PLAT, see security considerations presented in Section 5 of [\[RFC6146\]](#).

To implement a CLAT, see security considerations presented in Section 7 of [\[RFC6145\]](#). And furthermore, the CLAT SHOULD perform Bogon filter, and SHOULD have IPv6 firewall function as a IPv6 router. It is useful function for native IPv6 packet and translated IPv6 packet. The CLAT SHOULD check IPv6 packet received from WAN interface. If the packet is invalid prefix (i.e., it is not XLAT prefix), then SHOULD silently drop the packet. In addition, the CLAT SHOULD check IPv4 packet after the translation. If the packet is not match private IPv4 address of LAN, then SHOULD silently drop the packet.

9. IANA Considerations

This document has no actions for IANA.

10. Acknowledgements

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