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**ISP Shared Address after IPv4 Address Exhaustion**  
**draft-shirasaki-isp-shared-addr-00**

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Abstract

This document defines IPv4 "ISP Shared Address" to be jointly used among Internet Service Providers. This space is intended to enable

Internet Service Providers' continuous IPv4 based operation even after the IPv4 address exhaustion.

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## **1. Introduction**

The current model [[EXHA](#)] shows that global IPv4 addresses from the IANA pool will run out in a few years. This document is proposed to prepare for the IPv4 address exhaustion. NOT to expand private address space [[RFC1918](#)].

## **2. Prerequisite**

It assumes an environment where end-users use [RFC1918](#) address behind Customer Premises Equipment (CPE). The servers that have ONLY IPv4 address will continue to exist even after the IPv4 address exhaustion. However, ISPs cannot assign additional global IPv4 addresses to its end-users in order to access such servers.

## **3. Problem**

End-users without any global IPv4 address space will not be able to access to the IPv4 Internet after the IPv4 address exhaustion.

## **4. Goal**

The goal is to allow the end-users who don't have global IPv4 address to access to the IPv4-only servers without having to replace their equipments.

## **5. Solutions Using Existing Technology**

The following solutions using existing technology cannot achieve the goal mentioned above.

### **5.1. IPv6 to IPv4 Translator**

This solution has two problems. Firstly, some end-users still use PCs or LAN equipment that doesn't support IPv6. They cannot use IPv6. Secondly, some web hyperlinks have the numeric IPv4 address notation in URL. PCs having only IPv6 address cannot follow such hyperlinks.

### **5.2. [RFC1918](#) to IPv6 to IPv4 NAT**

This model is described in [[I-D.durand-v6ops-natv4v6v4](#)]. Under this model, ISPs must request end-users to replace the CPE, which is end-users' property. Furthermore, the replaced CPE must be "NATV4V6V4



capable" CPE, which is currently not readily available on the market. Even if "NATV4V6V4 capable" CPE will be available in the future, it is practically impossible for ISPs to make all their end-users replace their equipment.

### **5.3. [RFC1918](#) to [RFC1918](#) to IPv4 NAT**

In this model, ISP assigns [RFC1918](#) address to new end-users. ISPs provide the internet connectivity to such end-users using Carrier Grade NAT (CGN). This solution has two problems. Firstly, end-user's WAN (assigned by ISP) and LAN addresses may conflict. In such situation, end-users may have to renumber their address. Secondly, some firewalls/servers reject packets with [RFC1918](#) address as its source address for security reasons, therefore, end-users will not be able to access servers behind the same CGN.

### **5.4. [RFC1918](#) to IPv4 to IPv4 NAT**

In this mode, ISP requests a certain size of global IPv4 address space before the IPv4 address exhaustion to share the same range between a set of regions/areas within their infrastructure. However, this solution has some problems. Firstly, IPv4 global address will not be used efficiently compared to other solutions as it requires address space to be distributed for each ISP's infrastructure. Secondly, since an end-user's IPv4 address is not unique within ISP's infrastructure, it is difficult for ISP operators to confirm reachability to a specific user by sending packets, such as ICMP echo. Finally, the region may be fragmented to small pieces if ISP has only small blocks available for this purpose.

## **6. Proposal**

This proposal defines "ISP Shared Address" to be jointly used among ISPs. It is intended to be assigned between CPE and CGN. This space must not to be advertised to the Internet.

The size of the address space is TBD. Following table shows the coverage by size of ISP shared address.



Size	ISP Coverage
/10	49%
/9	58%
/8	69%
/7	85%
/6	96%
/5	100%

ISP coverage is the ratio of numbers of hosts on the Internet to numbers of hosts in the ISP which is covered by the size of ISP shared address as of June in 2008.

Table 1: Coverage by Size of ISP Shared Address

## 7. Advantages of This Proposal

Defining this address space enables ISPs to continue expanding their service without requesting end-users to replace or renumber their LAN equipment after IPv4 address exhaustion. Moreover, it overcomes problems described in [section 5](#) such as:

- o It supports "IPv4-only" equipment in end-users' network (problem in [Section 5.1](#))
- o End-users' WAN and LAN addresses do not conflict (problem in [Section 5.3](#))
- o End-users are able to access to servers behind the same CGN (problem in [Section 5.3](#))
- o It is possible for ISP operators to send packets to a specific end-user (problem in [Section 5.4](#))

## 8. Rationale behind the Proposal

The rationale to be used by only ISPs:

- To avoid address conflicts between end-users' WAN (assigned by ISPs) and LAN addresses

The rationale not to use 240/4:

- Many CPEs, routers, servers and other nodes cannot handle 240/4.

The rationale to prohibit advertising this address space:



- Many ISPs will use this same space.

The rationale to prohibit querying for reverse DNS to root DNS:

- Many ISPs will use this same space.

## **9. Possible Issues**

- Global prefix(es) will be consumed. However, it provides more benefit by providing ISPs with an option to continue IPv4 based operations even after the IPv4 address exhaustion.
- Some applications used by end users won't work in the Double-NAT network. However, providing end-users with an option to access to the IPv4 Internet with some limitations, is more preferable than providing no access to the IPv4 Internet after the IPv4 address exhaustion.

## **10. Operational Recommendation**

This address space must not be used at IXs. Reverse DNS queries for this address space must not be sent to root DNS servers.

## **11. 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.

## **12. IANA Considerations**

IANA is to record the allocation of the IPv4 global unicast address prefix TBD as an ISPs Shared use prefix in the IPv4 address registry.

## **13. Security Considerations**

ISPs should prevent packets to be sent out from its network with this space as source and/or destination address.

## **14. References**



### **14.1. Normative References**

- [RFC1918] Rekhter, Y., Moskowitz, R., Karrenberg, D., Groot, G., and E. Lear, "Address Allocation for Private Internets", [BCP 5](#), [RFC 1918](#), February 1996.
- [EXHA] Huston, G., "IPv4 Address Report", <<http://ipv4.potaroo.net>>.
- [I-D.durand-v6ops-natv4v6v4]  
Durand, A., "Distributed NAT for broadband deployments post IPv4 exhaustion", [draft-durand-v6ops-natv4v6v4-01](#) (work in progress), February 2008.
- [I-D.wilson-class-e]  
Wilson, P., "Redesignation of 240/4 from "Future Use" to "Limited Use for Large Private Internets", [draft-wilson-class-e-01](#) (work in progress), August 2007.

### **14.2. Informative References**

- [PROP58] Niinobe, S., Tomochika, T., Yamaguchi, J., Nishino, D., Ashida, H., Nakagawa, A., and T. Hosaka, "Proposal to create IPv4 shared use address space among LIRs", 2008, <<http://www.apnic.net/policy/proposals/prop-058-v001.html>>.

## **Appendix A. FAQ**

- Q1. Will this address space be used even if it requires large-scale renewal/renumbering of a network?
- A1. Yes, some people expressed their plan to use it in their network in APNIC Open Policy Meeting as well as in JPNIC Open Policy Meeting.
- Q2. Is this proposal intended to delay the date of IPv4 address exhaustion?
- A2. No. It is intended to address issues after the IPv4 address exhaustion.
- Q3. Is it possible to use this space instead of [RFC1918](#) address in private network?
- A3. No. Since it creates address conflicts between end-user's WAN (this space assigned by ISP) and LAN.
- Q4. In case of M&A between ISPs using Shared Address, what happens ?
- A4. Address conflict may happen. It is out of scope.



Q5. Is this proposal different from [[I-D.wilson-class-e](#)]?

A5. Yes. It is not intended to expand [RFC1918](#) address.

Furthermore, it does not consider 240/4 as usable address for this purpose.

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